

A CHILTON PUBLICATION

The IRON AGE

THE NATIONAL METALWORKING WEEKLY

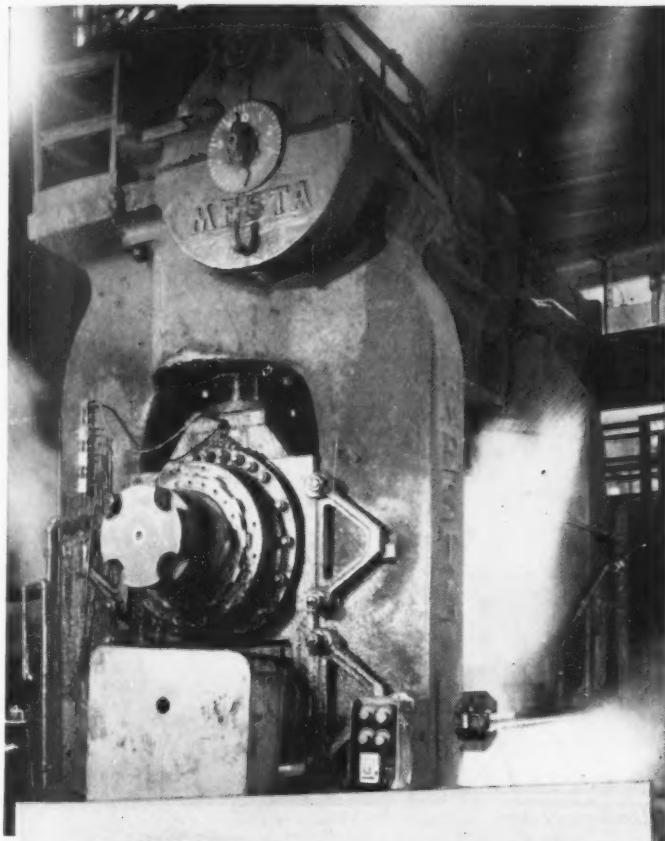
May 10, 1951

UNIVERSITY OF MICHIGAN

MAY 11 1951

UNIVERSITY OF MICHIGAN LIBRARIES
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TIMKEN® bearings average over 6½ million tons of steel rolled



One of the original Timken roll neck bearings of INLAND STEEL COMPANY'S 96" broad side mill. After 19 years this bearing is still giving dependable, trouble-free performance with a minimum of maintenance.

FOR 19 years Timken® roll neck bearings have been in continual service on the back-up rolls of this Mesta single stand 96" broad side mill at Inland Steel Company. Three of these bearings have 6,796,263; 6,760,235; and 5,982,806 tons to their credit. And they're still rolling today! This remarkable record is proof of the fact that Timken roll neck bearings are built to give long years of trouble-free operation.

Timken bearings eliminate complicated lubrication systems, permit use of simple and economical grease lubrication. Rolls can be changed easily and quickly. Mills can be stopped and restarted without loss of steel. No special thrust bearings are needed, for Timken bearings take both radial and thrust loads or any combination. And because Timken bearings minimize friction, higher mill speeds are possible.

Timken tapered roller bearings with balanced proportion design permit greater mill rigidity and larger diameter roll necks. Roll neck strength is increased 50 to 60%, load ratings up to 40%.

No other bearing gives you all the advantages you get with Timken balanced proportion roll neck bearings. Specify them for both new or existing equipment. For full information consult our roll neck bearing specialists. Write The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

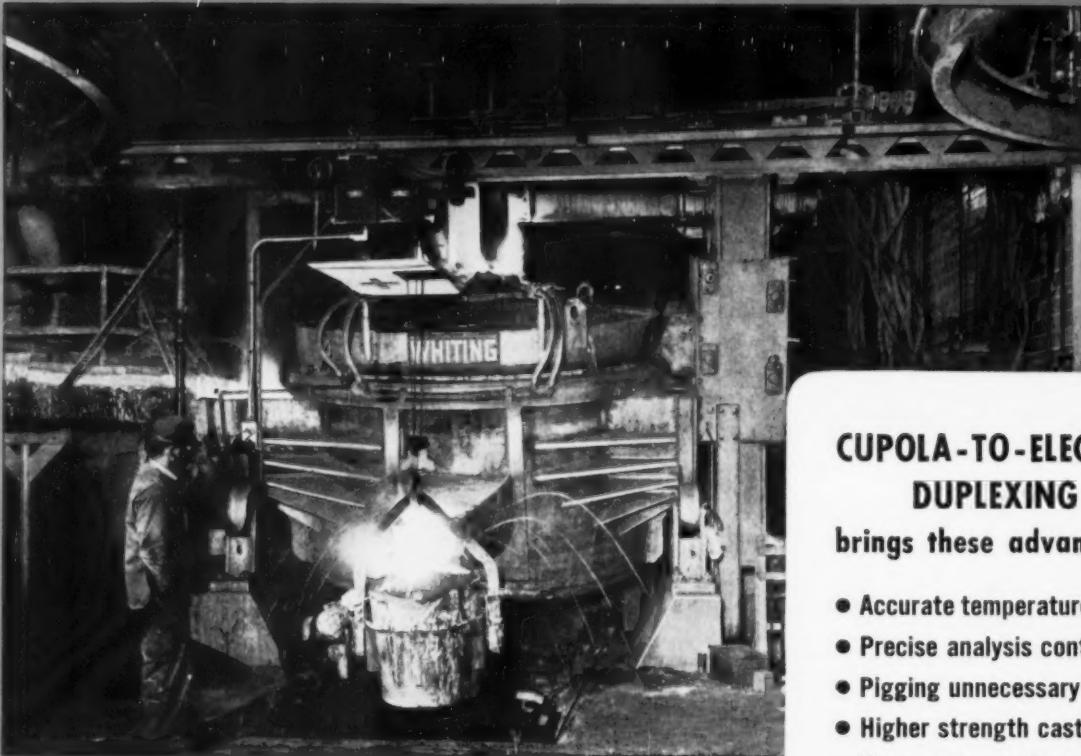
TIMKEN
TRADE MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS



NOT JUST A BALL • NOT JUST A ROLLER • THE TIMKEN TAPERED ROLLER BEARING TAKES RADIAL AND THRUST LOADS OR ANY COMBINATION



HOTTER METAL • BETTER ANALYSIS • LOWER COST with Cupola-to-Electric Duplexing



Where Whiting* Cupolas are used for prime melting and a Hydro-Arc* Furnace for finishing, foundrymen secure greatly improved results—in product quality, cost, and ease of operation.

The Hydro-Arc Furnace "levels off" the variable analysis of stratified cupola charges. It permits checking and correcting both the analysis and the temperature of the metal BEFORE it enters the mold. A chilled ladleful can be poured back into the furnace to make good castings, instead of pigs and scrap.

Some iron foundries, whose production tonnage does not warrant duplexing, are using only Hydro-Arc Furnaces for continuous or batch melting. This practice is not only practi-

CUPOLA-TO-ELECTRIC DUPLEXING

brings these advantages

- Accurate temperature control
- Precise analysis control
- Pigging unnecessary
- Higher strength castings
- Finer grain castings
- Permits continuous pouring
- Ladles filled faster
- Pouring delays eliminated
- Increased yield from alloys
- Less machine tool wear and breakage
- Faster machining speeds
- Fewer machine shop rejections



cal from a cost standpoint, but it eliminates the uncertainties due to poor quality coke, scrap, etc.

Bulletin FY-168 gives detailed information about the Whiting Hydro-Arc Furnace—write for a copy.

*Reg. U. S. Pat. Off.

WHITING

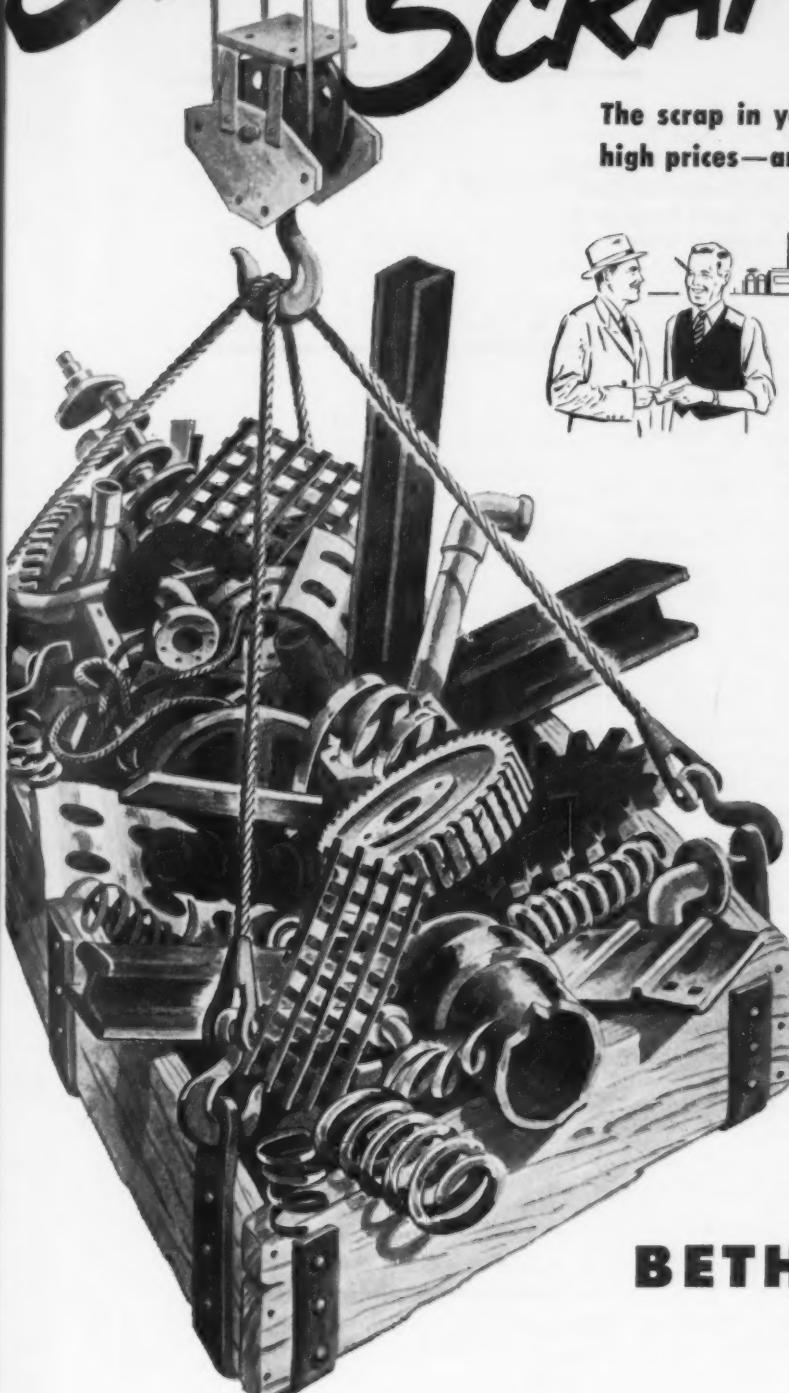
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SELL IRON and STEEL SCRAP NOW!

The scrap in your plant, factory, or shop will bring high prices—and help industry get the steel it needs



TODAY you're hearing a lot about the importance of scrap—iron and steel “junk” that often lies neglected in some obscure corner. Maybe, in your own plant or shop, there's a forgotten heap. Rusting tanks or boilers . . . obsolete machinery, long unused . . . plates, sheets, gears, rails, discarded months or years ago.

If so, put in a call to a scrap man. Scrap's his business; he buys! And he pays good prices!

The ferrous scrap you sell him will find its way to the steel mills—which, today, are hungry for it. Scrap, a truly vital ingredient in the making of steel, is in critically short supply. Millions and millions of tons are needed at once.

You can help—and help yourself as well—by cleaning out the scrap pile and selling it for cash. Get your scrap in circulation. Get it on the job!

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

BETHLEHEM STEEL



For names of local scrap dealers, consult the yellow classified pages of the telephone directory.

IRON AGE

CONTENTS

THE IRON AGE

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N. Y.*

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EDITORIAL Information Please! 7

NEWS INTERPRETATIONS

Newsfront	11
The Iron Age Summary	15
Machine Tool Highspots	31
On the Assembly Line	74
West Coast Progress Report	79
The Federal View	81

REGULAR FEATURES

Dear Editor	22
Fatigue Cracks	26
Dates to Remember	34
Free Publications	36
New Production Ideas	37
Iron Age Introduces	70
Iron Age Salutes	71
Construction Steel News	120
Clearing House	176

TECHNICAL ARTICLES

Explosion Test Used in Weld Studies	83
How Lincoln-Mercury Machines Axle Shafts	88
Navy Studies Jet Structural Alloys	91
Sealing Anodized Aluminum Increases Corrosion Resistance	96
Ductile Iron Replaces Alloy Gear Castings, forgings	99

SPOT NEWS OF INDUSTRY

CMP Gets Its Basic Structure for Operation	105
Industrial Shorts	106
Steel Warehouse Inventories Off 40 Pct	107
Save Labor—Save Time—Save Money	108
Bits and Briefs	109
Steelmen Seek Key to Future Market Trends	110
Machine Tool Orders Rocket Ahead	111
Controls Digest	112
Steel Imports Pass Exports	114

MARKETS & PRICES

Market Briefs and Bulletins	147
Nonferrous Metals Outlook	148
Iron and Steel Scrap Market	150
Iron and Steel Scrap Prices	152
Comparison of Prices	154
Steel Prices	156
Ferroalloy Prices	166
INDEX OF ADVERTISERS	193

IRON AGE

editorial

Information Please!

WE have heard gripes from Washington defense officials about the lethargy of the people. Well, why shouldn't the people be a little confused?

About 9 months ago defense officials were kidding the public about what the defense program would do to our economy. They said then that direct defense would take about 4 pct of the steel. Today they admit that, for some time, it will take 20 pct.

They said nothing about defense supporting requirements some months ago. They pooh-poohed the effect of the defense orders on steel supply. Well, defense supporting items plus direct defense will, by June, take more than 50 pct of the steel supply; later it will take 75 pct.

Many months ago we were treated with generalities from Washington. We still get that kind of pap today. We hear about sacrifice and how tough things will be soon. It is true that Mr. Wilson's report to the President told in bold terms what we face. But Mr. Wilson went to the defense job because it was bogging down.

We need more talk like Wilson's—with more specific details. Who is going to do what, when and how. It should be spelled out without a lot of press agentry and gobbledegook.

The military has not told the people how big their job will be in tons of this and that. Soon the military will get down to brass tacks. But when they get there will they take care of a few little items, which though small, can mess up the whole program?

Is the military going to buy what it needs when it needs it or is it going to be a mammoth storehouse ordering and stocking way ahead of the target date? Will it heed the President's order to avoid hoarding?

Are the special program projects controlled by NPA going to be cut to what is needed, when it is needed? Will we have some groups holding steel they cannot yet use and other groups yelling for steel they don't have?

Are we going to have censorship of news the only purpose of which is to hide blunders? Are we to have security censorship for no valid reason? We need to ask ourselves: Will this help us more than the Russians if it is made public?

While we are on it why do we have to repeat the mistakes that were made in World War II. Can it be that politics, personal jealousy and half-baked ideas will once again waste money and time—when we can least spare either?

What the American people need is more information about what their government is doing, why it is doing it and what it hopes to get done—and not in general kindergarten terms. Business and the people want to know in plain, simple terms what their job is. Then they want to be saved from being hamstrung in trying to do that job.

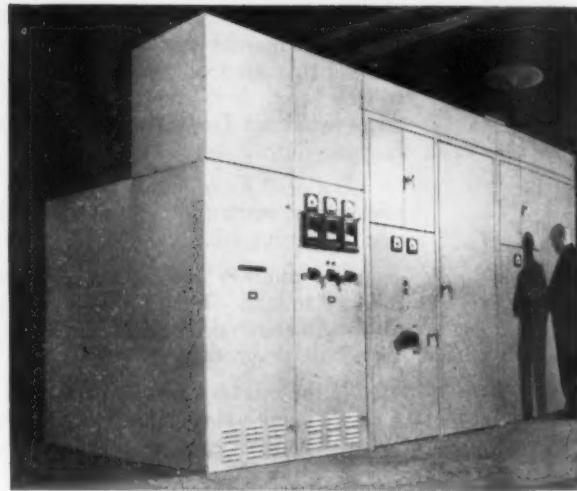
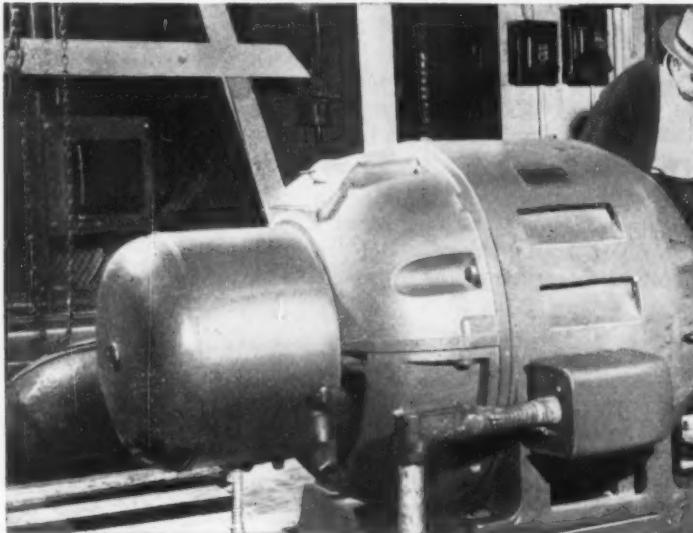


Editor

DEPENDABILITY where it counts



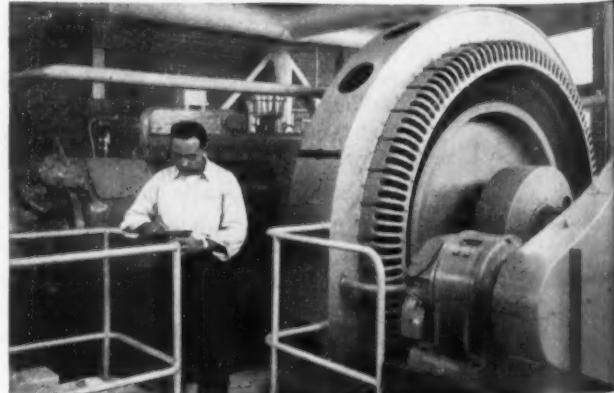
SYNCHRONOUS MOTORS



Dependability and long life are a must in water-pumping equipment. Cohoes, N. Y. selected a G-E Tri-Clad* 500-hp synchronous motor for their raw-water pumping station. And as protection against a short-circuit capacity of 60,000 kva, Cohoes selected G-E Limitamp high-voltage control. Besides providing accurate control for the motor, Limitamp clears shorts from the line in less than half a cycle—before damage can come to either motor or control. Ask your nearest G-E sales office for more information on Limitamp control.

* Reg. U. S. Pat. Off.

ON CRITICAL PUMPING OPERATIONS



Driving compressors in gas pumping station serving hundreds of homes, motor requirements were—dependability and low cost. This G-E 1500-hp synchronous motor scores on both counts.



LARGEST STEEL PROJECT IN HISTORY

Underway in Philadelphia Area

United States Steel building greatest plant with capacity of 1,800,000 tons at cost of \$400 million . . .

National Steel building new plant to produce 1,000,000 tons annually—cost \$200 million . . . both to be completed by 1952—with some units in production by end of 1951.

The Philadelphia National Bank offers its full cooperation to the many companies that will follow "steel" to Philadelphia—whether they be large or small.

Has the largest combined Capital and Surplus of any Philadelphia bank . . . \$50 million . . . permitting individual loans up to \$5 million.

Has the biggest Foreign Department in Philadelphia . . . finances more exports and imports moving through the Port of Philadelphia than any other bank.

The Philadelphia National Bank is Philadelphia's oldest and largest bank . . . today has resources of over \$800 million.

Has 25 of the Nation's 30 largest manufacturers as depositors . . . and still appreciates the importance of serving small and medium sized accounts.

**If because of
STEEL...
you plan to do business
in Philadelphia**

**The number 1 bank
in Philadelphia...
can help you in
more ways than one!**

THE PHILADELPHIA NATIONAL BANK

Established 1803

PHILADELPHIA 1, PA.

Member Federal Deposit Insurance Corporation

FREE publications

These publications describe money-saving equipment and services...they are free with no obligation...just fill in and mail the postcard on the opposite page.

Production Facilities

The available production facilities for defense contracts offered by Brandywine for general welding and fabrication, including stainless steel, Monel, aluminum and cast iron, are detailed in a 3-p. listing. Peacetime products of this company include conveyors of all types, all sizes of tanks, and various other weldments in which this shop handled all layout, shearing, punching, forming, welding and spray painting. *Brandywine Metal Products Co.*

For free copy insert No. 1 on postcard.

Electric Lift Truck

The Go-Getter power lift truck, available in high and low lift fork, pallet and platform types, is described in a new 4-p. bulletin listing important features and showing how power moving and piling with this unit converts waste space into profits and speeds production. Information is given on 6 standard models of this powerful electric light-weight walk-along truck. *Revolvator Co.*

For free copy insert No. 2 on postcard.

Spinning, Fabricating

Numerous illustrations that suggest ways in which metal spinning can be employed to achieve lower production costs are presented in a new 40-p. bulletin also describing Spincraft facilities for metal spinning and fabricating. The booklet points out that spinning provides a universal method of economical fabrication, and that this company is geared to both intricate and simple individual or mass production projects. *Spincraft, Inc.*

For free copy insert No. 3 on postcard.

Screw Machine Tools

Precision tools for screw machines that can be changed in 10 sec for right or left hand turning are described in a new 28-p. catalog on R&L products. The various tools covered are shown in photos and dimensional drawings, and detailed information is given on prices, sizes and capacities. Other useful data are shown on tool care. *R & L Tools.*

For free copy insert No. 4 on postcard.

Jointings and Packings

A new series of illustrated booklets give details on Nebar bonded cork jointing, Metaflex edge wound steel and asbestos gaskets, Lion automatic and expanding packings for heavy duty hydraulics, Twinset packings and other items. The bulletins describe and illustrate the products of this British company, presenting engineering data and properties, listing recommended uses, and pointing up the advantages offered by these jointings and packings. *James Walker & Co., Ltd.*

For free copy insert No. 5 on postcard.

Transformer Buyer's Guide

A new 93-p. brochure supplying pertinent buying information on G-E instrument transformers is divided into sections which offer technical data on indoor and outdoor potential transformers, current transformers, metering outfits, potential and current portable transformers. Listings of ratio and phase-angle tests, coupled with tables covering the mechanical and thermal limits of current transformers, round out the balance of the brochure. *General Electric Co.*

For free copy insert No. 6 on postcard.

Protects Screw Threads

Covering design data on helical-wire thread inserts and their use in the protection and repair of tapped holes, a new 16-p. bulletin explains how these inserts are used as original manufacturing components to protect tapped threads in aluminum, magnesium, plastics, iron, steel and wood against stripping, wear, corrosion, seizing and galling. Also covered are uses in production salvage operations—to repair threads damaged during the manufacturing process—and in maintenance operations—to repair threads damaged in use. *Heli-Coil Corp.*

For free copy insert No. 7 on postcard.

Fast Work Feeding

The Bellows rotary work feed table is described in a new 12-p. bulletin showing installation photographs and detailing all parts. It includes dimensional drawings and specification data, and also shows wiring diagrams and electrical hook-ups to combine the unit with other Bellows "packaged" pneumatic devices. *Bellows Co.*

For free copy insert No. 8 on postcard.

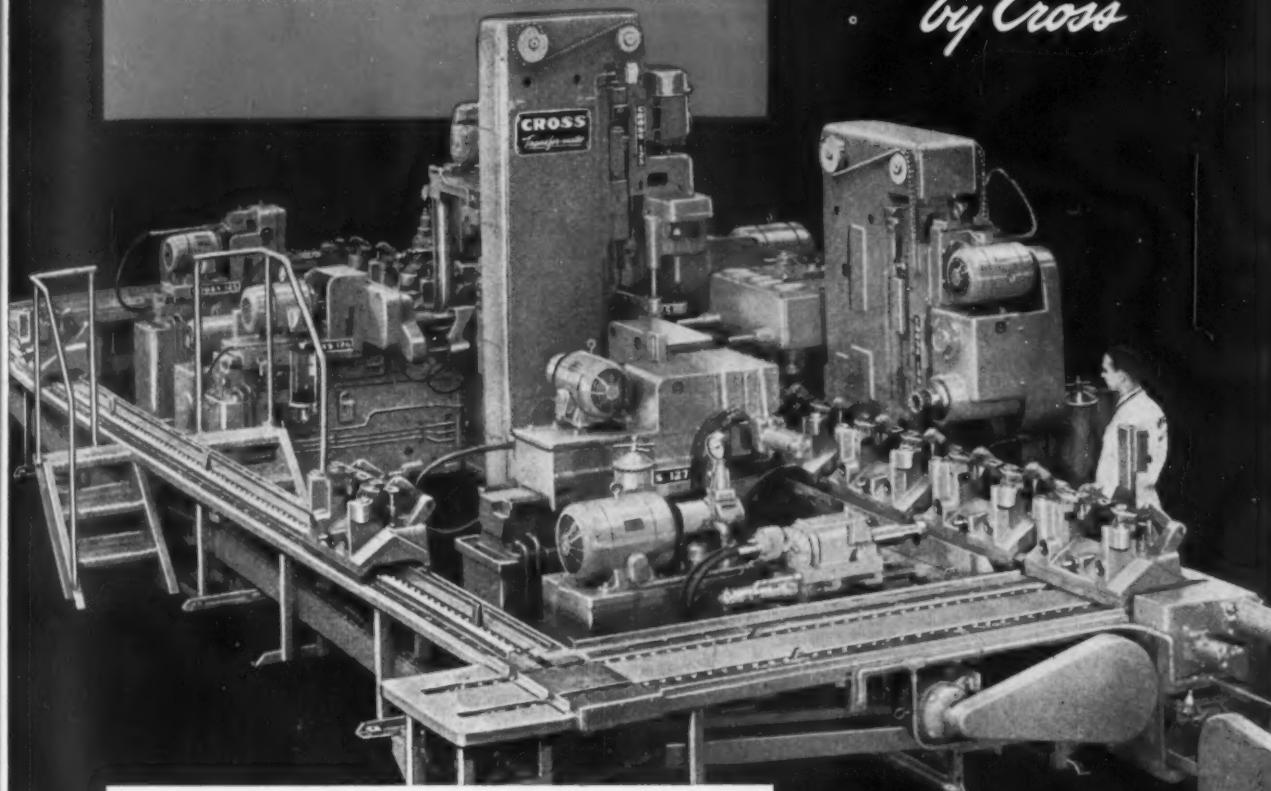
Expanded Finishing Line

A more complete service for lapping, polishing or fine finishing is provided by the line of accessories for use with Elgin diamond compound shown in a new 4-p. catalog and price list. Included are felt bobs and wheels, abrasive stones, polishing brushes, wood lapping sticks and wheels, specially selected for use on plastic molds, carbide dies, drawing and forming dies, and precision parts. Features of

Turn to Page 130

**Mills, Drills, Bores,
Reams, Chamfers
and Taps
Exhaust Manifolds**

*Another
Transfer-matic
by Cross*



- ★ 130 pieces per hour at 100% efficiency.
- ★ 10 stations—1 for loading, 4 for milling, 4 for drilling, reaming, boring, 1 for tapping.
- ★ Palletized work-holding fixtures hold parts securely during all operations.
- ★ Integral conveyor returns palletized fixtures from last machining station to loading station.
- ★ Hydraulically operated power wrench provides automatic operation of work-holding fixtures.
- ★ Built-in, vibrating type chip conveyor.



Established 1898
THE CROSS CO.
 DETROIT 7, MICHIGAN
Special MACHINE TOOLS

production ideas

Continued

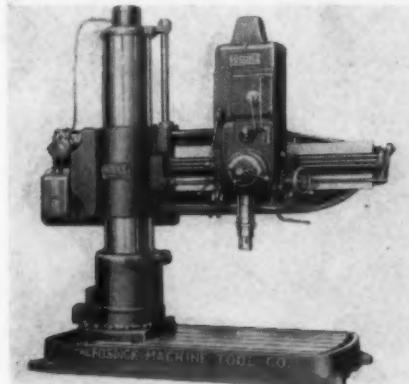
face; the chisel-type digs under a part resting on the die. Precision clamping with these jaws was perfected with new vise and cone-type grippers. Specialty jaws for gripping unusual stampings include: Hood-type, for application where gripping edge is lacking; a Neoprene tipped grip to protect parts with special finishes; a pivot-type, swiveling laterally to clear tight die areas; and a confined-type, that locks a vertical flange stamping without damaging edges. *Sahlin Engineering Co.*

For more data insert No. 31 on postcard, p. 37.

Improved Radial Drill

Features new mirror-finish column.

On all Fosdick hydraulic radial drills the column is now superfinished, eliminating grinding wheel feed lines on the column. The arm and column lubricating oil reservoir is replenished each time that the arm is elevated. The source of



oil is taken from the pressure side of the hydraulic elevating motor. All excess oil is returned to the reservoir and strained and filtered before reusing. A Neoprene wiper and a felt oil distributor clean and lubricate the column. *Fosdick Machine Tool Co.*

For more data insert No. 32 on postcard, p. 37.

Explosion-Proof Housing

For use on Ross electrically operated pilot controlled valves.

The cover, which can be used wherever fire and explosion hazards exist, is manufactured of cast-aluminum to Underwriters' Laboratory specifications, Class I, Group D, air break type. Provision is made for

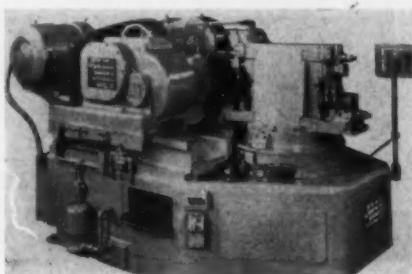
standard conduit connection. The cover may be used with $\frac{1}{4}$ to $1\frac{1}{4}$ in. size pilot operated straight-way, three-way, four-way and four-way five port models for single solenoid operation; and for double solenoid, momentary operation of Ross base mounted pilot controlled valves. *Ross Operating Valve Co.*

For more data insert No. 33 on postcard, p. 37.

Duplex Milling Machine

Machines tractor side bars at 268 pieces per hr using carbide cutters.

A rotary indexing table on the duplex milling machine carries two sets of work-holding fixtures. While the two milling heads are machining the part held at the work point, the operator is unloading and loading the open fixture. Cycle of op-



eration is automatic when the operator presses the cycle button. The table indexes 180° and is clamped solidly into position. The two opposed milling heads traverse forward, feed to an adjustable stop and rapid traverse return. The heavy duty milling heads utilize up to 30 hp and have 2-in. quill adjustment for cutter wear. Carbide or high speed steel cutters can be used. *Motch & Merryweather Machinery Co.*

For more data insert No. 34 on postcard, p. 37.

Marking Machine

Trade-marks automobile gaskets.

The machine is motor driven utilizing a 43 rpm gear reduction motor for 110-220 v, ac. A cartridge type heating element using the same current provides the heat for the die head that carries interchangeable dies or a hot stamping numbering head. An automatic transfer tape feed provides color for the actual stamping operation. A foot operated clutch gives the operator full control of the stamping operation, which may be 43 parts per min. *Acromark Co.*

For more data insert No. 35 on postcard, p. 37.

Portable Manual Welder

For Unioamelt welding short seam.

Parts of the welder which include the welding head, a voltage control box and a 75-lb capacity spoke-type rod reel, are mounted on a steel chassis equipped with casters, and



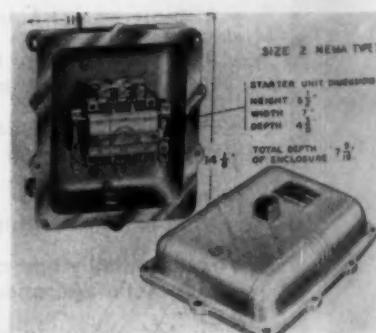
a lifting eye. A lightweight hopper, that holds 3 lb of the granular welding composition, is part of the hand unit. The control automatically maintains constant welding voltage and an operator needs no special training. Welding starts when the rod is scratched on the workpiece, and stops when the rod is lifted away. *Linde Air Products Co.*

For more data insert No. 36 on postcard, p. 37.

Magnetic Starters

Explo-Safe and weatherproof, with Feraloy cast housing, RA mechanism.

According to the manufacturer, the uniform line of starters is smaller and lighter in weight, based on the advanced right-angle



design mechanism included within a special design Feraloy housing. Straight-through wiring and ample working space for easy installations are other features. Terminals and contacts are accessible from the front. Line and load may be completely separated; circuits immediately identified. Motor controls

Turn to Page 135

FOR Increased Production OF ALUMINUM ...



Pictured is a 350-Ton
Hydraulic Stretcher with De-
twisting Head and Four-Way Jaws
built by Sutton Engineering Company under
license from The Aluminum Company of America.

Now—once again . . .

You who make aluminum are engaged in a nation-wide expansion program.

Now—once again . . .

Sutton engineers are prepared to aid with precision equipment—designed specifically for you—made to handle strenuous loads in your surge forward to increased production.

SUTTON *Engineering* COMPANY

Manufacturers for Ferrous and Non-Ferrous Industries
BELLEFONTE, PENNSYLVANIA

WRITE FOR PROPOSAL

Specific information will be given in answer to any stretching, straightening, or levelling problem you may have. There is no obligation for this service.

Hydraulic Stretchers of all Sizes and Capacities for Bars, Tubes, Shapes and Sheets.

Detwisting Machines for Bars and Shapes.

Rotary Straighteners for Round Bars and Tubes from $\frac{1}{8}$ " to $18\frac{1}{2}$ " in diameter.

Backed Up Sheet Levellers and Plain Roller Levellers for Sheets and Plates.

Roll Straighteners for Flats, Squares, Hexagons and Shapes.

IRON AGE

introduces

Floyd W. Crouch, appointed chief metallurgist, and **Jaye S. Gamble** as assistant chief metallurgist at National Works of U. S. Steel's NATIONAL TUBE CO., Pittsburgh. **Arthur W. Thornton**, appointed as division superintendent, pipe production, finishing and shipping.

Robert J. Stack, succeeds **J. R. Millar** as president of NATIONAL AUTOMOTIVE FIBRES, INC., Detroit. Mr. Millar will continue as chairman of the board.

Richard J. Brown, appointed advertising and sales promotion manager of the Delta Power Tool Div., of the ROCKWELL MFG. CO., in Milwaukee.

Jack J. Tipton, appointed chief project engineer of the HAYS CORP., Michigan City, Ind.

John M. Newton, appointed manager, commercial and industrial sales in the Pittsburgh district sales office of TRION, INC., McKees Rocks, Pa.

W. B. Bainton and **P. R. Hatch**, elected vice-presidents of the BROWN & SHARPE MFG. CO., Providence. Mr. Bainton's duties will include general supervision of all problems relating to design and production, while Mr. Hatch will head the sales activities and continue as assistant secretary.

Fred M. Gillies, elected to the board of directors of ACME STEEL CO., Chicago. **William C. Fork** was elected vice-president.

L. H. Matthey, elected vice-president and assistant general manager, and **F. B. Riggan** was elected vice-president in charge of research and development of the KEY CO., E. St. Louis, Ill.

Donald M. Morrison, joined JOHN MOHR & SONS, Chicago, as sales engineer.

F. Gordon Mackay and **Robert A. Hughes**, appointed to the staff of the HARLEY EARL CORP., Detroit.

Fred T. Roberts, named manager of truck, bus and trailer wheel sales of the BUDD CO., Philadelphia.

E. T. Asplundh, named president of SOUTHERN ALKALI CORP., Pittsburgh. **Clarence M. Brown** was named chairman of the board with the following directors and officers: **Leland Hazard** as vice-president and general counsel, **W. I. Galliher**, a vice-president, **Richard B. Tucker** and **E. D. Griffin** as directors.

Morse G. Dial, elected executive vice-president of UNION CARBIDE & CARBON CORP., New York. Dr. **George O. Curme, Jr.**, elected vice-president in charge of research.

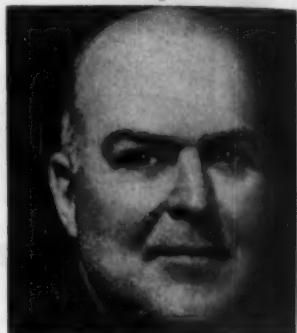
L. B. McKnight, elected executive vice-president of the CHAIN BELT CO., Milwaukee.

Gene Heller, appointed to direct the sales and advertising of DIAMOND MACHINE TOOL CO., Los Angeles.

Carl E. Schultz, elected president of BENTON HARBOR MALLEABLE INDUSTRIES, Benton Harbor, Mich. Other officers elected: **O. C. Schultz**, assistant to the president; **H. S. Gray**, secretary; **A. C. Sinnott**, treasurer; **R. W. Wolfram**, sales manager; **J. P. Bell**, personnel director; **V. L. France**, general superintendent.

John P. Kelsey, elected an assistant treasurer of SHARON STEEL CORP., Sharon, Pa.

Turn to Page 72



CYRUS N. JOHNS, named president of American Chain & Cable Co., Inc., Bridgeport, Conn.



W. P. SNYDER, III, elected president of Shenango-Penn Mold Co., Pittsburgh.



ROBERT J. RYAN, elected president of the Nooter Corp., St. Louis.

IRON AGE

salutes

Joseph L. Block



Soft-spoken Joe Block, Inland Steel Co.'s clear-thinking vice-president in charge of sales, has faith in his product, his company, and his industry.

Joe is devoted to the steel industry. He understands it and the part it plays in the nation's welfare. He cuts quickly to the core of complicated problems. He served on the steel division of WPB in World War II and was later deputy director.

Part of the success of WPB's controlled materials plan stemmed from a suggestion by Joe Block. He knew priorities were worthless when issued for more than available material. Joe urged monthly directives to steel producers which would be geared to the nation's needs.

In March 1944, with steel production staggering under war demands, Joe Block and his associates were instrumental in boosting plate production.

As a member of the present steel advisory board for ESA and NPA his opinions are sought by Washington. He knows what the steel industry can do and how it can best fulfill the needs of the defense program.

Raised in an atmosphere of steelmaking, Joe Block upholds the best traditions of the industry. He takes steelmaking seriously and, without pretense or fanfare, has worked unflaggingly to forward the industry's and the nation's interests. His efforts have won wide respect.

Joe is a great admirer of Lincoln. He's made a study of Lincoln's life and has a sizable collection of Lincolnia. He's a gin rummy expert and ready to play anyone, anywhere, at the drop of a deck.

IRON AGE introduces

Continued



ROBERT G. LEARY, elected vice-president and general sales manager of the Rigidized Metals Corp., Buffalo.



HERMAN A. BOTTENHORN, appointed chief engineer of Loewy Rolling Mill Div., Hydropress, Inc., New York.



FRANK U. HAYES, elected vice-president and sales manager of the Bullard Co., Bridgeport, Conn.



W. F. TUTTLE, appointed chief engineer of Armco Steel Corp., Middletown, Ohio.

Charles H. Rese, in charge of raw material purchasing for SPRINGFIELD MACHINE & STAMPING, INC., Van Dyke, Mich.

D. K. McIlvanie, appointed manager, electronics division of the POWDERED METAL PRODUCTS CORP., Franklin Park, Ill.

Glenn N. Hunolt, named district manager of the St. Louis office of the H. M. HARPER CO.

E. W. Ritter, named a vice-president, and E. V. Huggins was elected executive vice-president of WESTINGHOUSE ELECTRIC INTERNATIONAL CO., the foreign trade subsidiary of Westinghouse Electric Corp., Pittsburgh. William G. Marshall, who has been vice-president in charge of industrial relations, is retiring after 17 years.

Rudolf Becker, joined the BLAW-KNOX CONSTRUCTION CO., Pittsburgh, and will be associated with the chemical plants division.

Charles S. Jarmon, appointed comptroller of the RIVERSIDE METAL CO., Riverside, N. J.

R. C. Fish, transfers as general manager of iron ore operations in Duluth to Cleveland, for the M. A. HANNA CO. D. N. Vedensky was appointed director of research and development and Morris Bradley was named director of public relations.

Richard J. Ruff, elected president of the CATALYTIC COMBUSTION CORP., Detroit.

W. Austin Bishop, appointed to the personnel division staff of the PENNSYLVANIA SALT MFG. CO., Philadelphia.

A. Gallagher, appointed purchasing agent of WALL WIRE PRODUCTS CO., Plymouth, Mich.

Sailor E. Beer, named distributor sales manager for the MONARCH MACHINE TOOL CO., Sidney, Ohio. Willis H. Kuhlman, named as supervisor of Monarch Mona-Matic lathe sales; Donald J. Harshbarger was transferred from the New York sales office to Pittsburgh and Harry C. Hennequin will replace Mr. Harshbarger in New York.

Fred H. Spenner, named vice-president and executive assistant to the president of SCULLIN STEEL CO., St. Louis.

Charles T. Fisher, Jr., elected to the board of directors of the NATIONAL STEEL CORP., Pittsburgh.

Stuart H. Levison, elected vice-president in charge of zinc and coal operations of AMERICAN SMELTING & REFINING CO., New York.

H. H. Bunchman, elected a director along with V. P. Rumely and S. M. Roberts to fill vacancies on the board of directors of the CRANE CO., Chicago. E. E. Wyatt and L. L. Hill were made executive assistants; P. L. Yates was made assistant comptroller and K. L. Karr was elected secretary.

Arthur B. Kinley and Wayne L. Smith, named Western general machinery division sales representatives for ALLIS-CHALMERS MFG. CO. Mr. Kinley will be in Spokane and Mr. Smith in Denver. John Wiehe and Walter Wenzel, named heads of a new plant engineering and planning department at the Norwood, Ohio, works.

W. C. Stolk, succeeds C. H. Black as president of the AMERICAN CAN CO., New York. Mr. Black becomes chairman of the board of directors succeeding D. W. Figgis, who will continue to serve in an advisory capacity. S. D. Arms, elected vice-president in charge of the Atlantic division succeeding R. L. Sullivan, who has retired after being with the company for 47 years.

OBITUARIES

Alexander H. Craig, associated with the firm of J. H. Sessions & Sons for nearly 45 years, at his home in Bristol, Conn.

Louis Popper, 61, owner of the E. Popper Iron Co., Calumet City, Ill.

Elmer J. Nooter, president of Nooter Corp., St. Louis. Though only 42, Mr. Nooter had devoted 25 years to the industry.

D. R. Burr, 77, retired former consulting manager of the Mechanical Goods sales department at the Goodyear Tire & Rubber Co., at Ft. Lauderdale, Fla.

Douglas M. Eck, 44, sales representative of Acme Steel Co., at his home in Portland, Me.

MESTA

Heavy Duty Roll Grinders

Mesta Roll Grinders of simplified design are the most accurate and dependable grinding machines available. Built with precision for finest finishing and ruggedness for heaviest roughing.

Finishing a 36½" x 56" Mesta Alloy Iron Roll in a Mesta 60" Heavy Duty Roll Grinder.

UNIVERSITY OF MICHIGAN LIBRARIES

Designers and Builders of Complete Steel Plants
MESTA MACHINE CO., PITTSBURGH, PA.

on the assembly line

*automotive
news and
opinions*

**Clue to U. S. auto production trend
is 112,000 loss by GM and Ford . . .
Steel cuts key to future production.**



by Walter G. Patton

Auto Production—Sideline quarterbacks, in and out of Washington, who try to reconcile auto production figures with government edicts will find themselves in an involved situation. Here's an example: Washington has ordered a cut in steel usage which would normally mean reduced passenger car assemblies.

Largely as a result of this order, Ford's 1951 passenger car output is down approximately 9 pct. The GM reduction in passenger car output is 8 pct. Meanwhile, Chrysler, which was out on strike for 100 days last year, has added 336,000 units to 1950 output.

Result of this jockeying is that the industry has assembled on an average during each week of 1951 approximately 122,400 passenger cars compared with only 106,000 built during the first 4 months of 1950. The average weekly increase in Chrysler output alone this year is nearly 20,000 units—more than accounting for the increase.

Truck Output High—The 1951 truck total is equally misleading. Truck assemblies for the industry have exceeded 1950 output for the year-to-date by nearly 105,000 units. The Automotive News estimate for 1951 is 506,000 units compared with 401,000 a year ago.

A close look at the record, however, shows that most of the increase is accounted for by Dodge, International and Willys. Strikes or defense orders have had a substantial influence on comparative production figures in each of these plants. Dodge output has increased from 8700 to 55,100. Neither Ford nor Chevrolet show any appreciable change.

Shortages Ahead—The fact that average weekly production of autos and trucks has been booming along more than 22,000 units ahead of last year is no indication the industry does not face a serious materials situation. Experience shows auto factories usually turn out more cars and trucks than their available materials would seem to permit.

Nevertheless, despite the apparently contradictory totals for the industry, Ford and GM taken together have built 112,000 fewer vehicles than they assembled during the first 4 months of last year. This is a truer indication of what is happening to U. S. car production than a casual glance at the totals. Meanwhile, there are reports the industry has accepted a further cut to 30 pct less steel for passenger cars and light trucks for the third quarter.

Tooling Costs High—The high cost of new tooling for passenger cars, while unbelievable to the layman, is well understood by car producers. For example, it is not uncommon to invest \$400,000 or more in necessary dies for a new hood.

This includes engineering, wood patterns, plaster models and the necessary form, punch, and trim dies to be used in the press lineup. Hoods or bonnets present one of the most difficult die problems in producing a modern automobile.

Small Parts Expensive—Tooling for volume production of even small parts of a passenger car is very expensive. Recent estimates by the trade place the cost of a small stainless steel decorative part for the rear fender of a new model passenger car at approximately \$100,000. In addition to multiple operations of forming, punch and trim, several sets of dies may be required to provide alternate sources of production. An added complication is right and left hand dies plus the difficulty of forming stainless steel in a die.

Minimum Wage?—Ask your Congressman how to account for this.

WHEELABRATOR®

AIRLESS BLAST CLEANING

**pays for itself in 3 months' time
cleaning bolts prior
to glass coating**

Sta-Rite Products, Inc., Elkhorn, Wisconsin, installed a Wheelabrator Tumbblast to replace costly, laborious sandblasting for the dual purpose of removing heat treat scale from steel bolts and providing a surface to which glass will bond. These glass-lined bolts are used in A. O. Smith's "Harvestore", a closed farm storage structure. Their experience is typical of the benefits obtained by thousands of plants which use Wheelabrator equipment for finishing, surface preparation and cleaning operations.

MORE PRODUCTION IN LESS TIME

2000 bolts Wheelabrated in 20 minutes. Maximum output with airblast — 294 in 15 minutes.

REDUCED COSTS

Unit costs slashed 72% — a saving of \$.0128 per piece.

Daily saving of \$153.80 paid for entire investment in less than three months.

IMPROVED PRODUCT

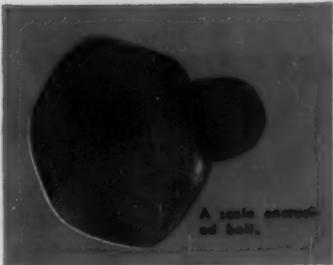
No more bonding rejects resulting from improper cleaning. Entire surface including threads uniformly cleaned.

Etched surface enables glass to fuse into metal for a permanent bond.

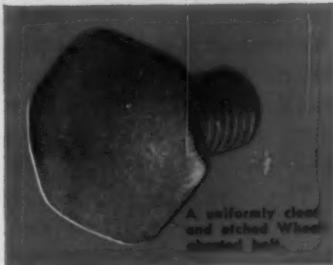
BETTER WORKING CONDITIONS

Operation is quiet and clean — operator removed from blast cabinet.

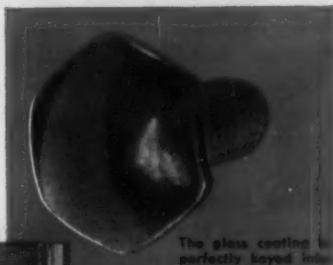
Wheelabrating can probably provide similar production increases, cost reductions and product improvement for you. Write today for details.



A small etched bolt.



A uniformly clean and etched Wheelabrated bolt.



The glass coating perfectly keyed into the steel surface.



The Wheelabrator Tumbblast which provides a \$153.80 daily saving in processing costs.

**WRITE TODAY for a complete description of all phases
of airless blast cleaning as described in Catalog 74B.**



American
WORLD'S LARGEST BUILDERS OF AIRLESS BLAST EQUIPMENT

WHEELABRATOR & EQUIPMENT CORP.
510 S. Bryn Mawr Ave., Chicago 3, Illinois



assembly line

Continued

A small Detroit shop was recently visited by a government representative. The government man said he was checking compliance with the minimum wage act which calls for payment of \$1.75 per hr in this work classification. The particular shop pays a minimum wage of \$3.00 per hr.

The proprietor produced his labor contract to show that \$3.00 was the minimum wage. Nevertheless the government representative insisted upon (1) going through his books with a fine-toothed comb, (2) interviewing all shop people individually to verify the \$3 rate.

New DeSoto Engine—Pilot production of the new DeSoto engine will get under way this month or early in June. The engine, except for reduced bore and some minor changes in valves and accessories, will be a duplicate of the new Chrysler V-8.

U. S. AUTOMOBILE SCORE BOARD

(Thousands of Vehicles)

		Big Three	Others	Total P. C.	Trucks	U. S. Vehicles
To date	1951	1,763	321	2,084	506	2,590
(4/29)	1950	1,547	254	1,801	401	2,202
Weekly Av.	1951	103.5	18.9	122.4	29.8	152.0
(Thru 4/29)	1950	91.1	14.9	106.0	23.8	129.8
Last week	1951	105.4	15.5	120.9	33.5	154.4
Latest week	1951	97.6*	15.8*	113.4*	30.5*	143.0*

* Preliminary estimate.

Source: Automotive News.

There are also reports that Plymouth plans to build a high compression overhead valve inline 6-cylinder engine to replace its present powerplant. Reported horsepower of the new DeSoto engine is about 130. Dodge may have its new V-engine in production in December or early next year.

Ford Tests Engine—When they are introduced, the new Ford engines will have behind them one of the longest records of testing in the field of any of the new passenger car powerplants. The new Ford engines are conventional in design and have resulted from a long series of intensive studies.

Combines New Features—The first hemisphere-shaped combus-

tion chamber employed by the U. S. automobile industry was used in the Liberty engine. A combustion chamber of the same general shape was also employed by Wills St. Clair. It should be pointed out, however, that the unique camshaft mechanism as well as many other features of the new Chrysler V-8 engine have never before been shown to the motoring public.

First Chrysler V-8—This may not have been Chrysler's earliest attempt but it is known that Chrysler engineers built a V-8 engine as early as 1934.

Alloy Shortage—The alloy shortage goes even further than bar steel. Automotive heat treating departments are also having alloy blues. Some recent attempts to modernize their furnaces have struck a snag. Furnace builders say they cannot furnish the necessary alloys and the automobile companies have likewise declined to dip into their own dwindling alloy supplies. The result to date is a stalemate that no one seems to be able to answer.

Heat Treaters Caught—Heat treating firms depending on D097 to renew their nickel supplies have been caught flat-footed by the recent failure to obtain nickel on their priority. Some firms see serious trouble ahead when the first failure in the present equipment occurs.

In the Detroit area, most commercial heat treaters are very busy. This applies both to firms specializing in the treatment of tools, dies and fixtures and to other firms performing production treatment of nuts, bolts, studs and other screw machine and stamped parts.

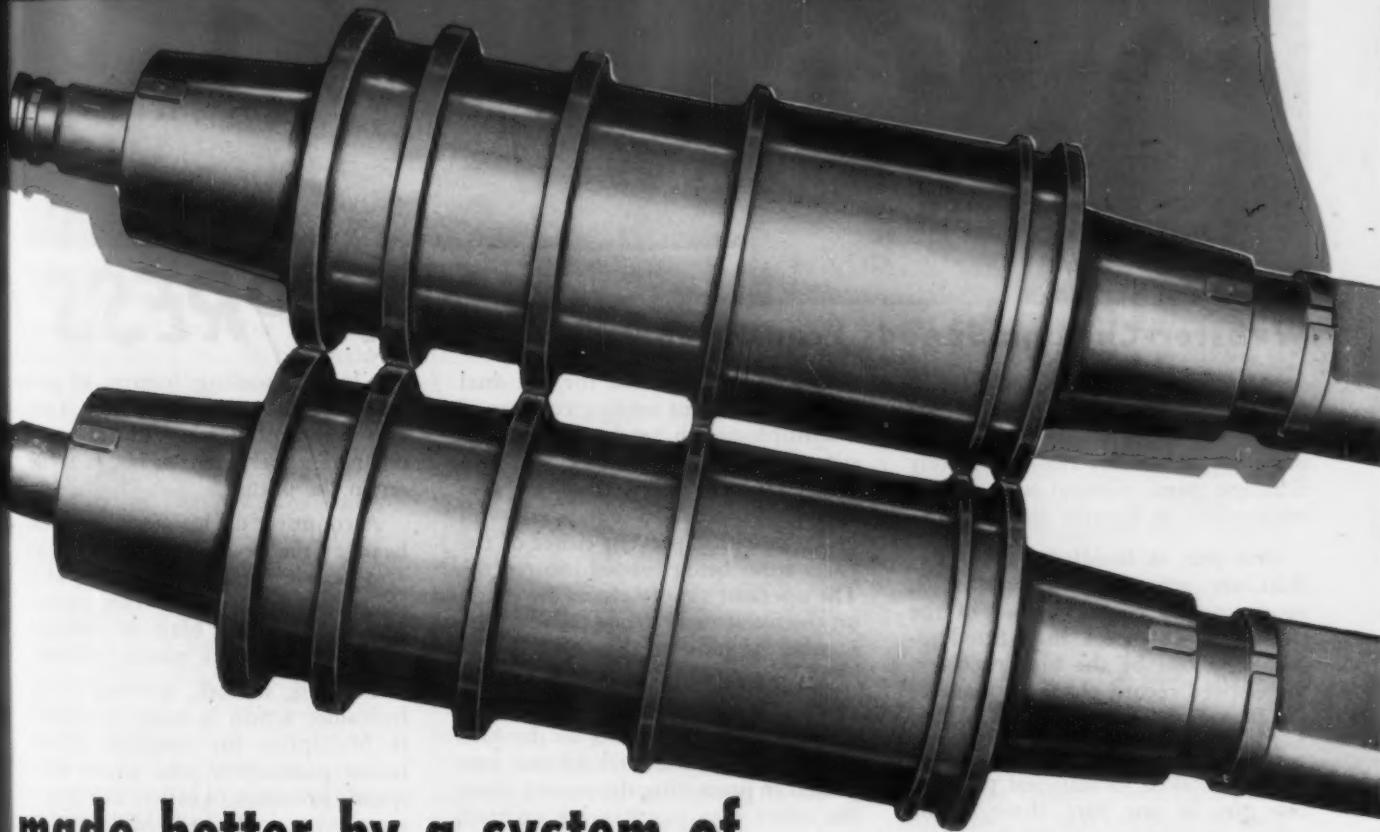
THE BULL OF THE WOODS

By J. R. Williams



Ohio Rolls

SHAPING METAL FOR ALL INDUSTRY



made better by a system of
INTEGRATED PROCESS CONTROL



Select from any of these eleven types
of Ohio Steel and Iron Rolls:

Carbon Steel Rolls Denso Iron Rolls Nickel Grain Rolls
Chioloy Rolls Chioloy "K" Rolls Special Iron Rolls
Roll-O-Cast Rolls Chilled Iron Rolls Flintuff Rolls
Chilled Iron Rolls Alloy Chilled Iron Rolls

Unique in roll manufacturing is Ohio Steel's Integrated Process Control. The same team of specialists is responsible for quality from receipt to shipment of your order. This group of metallurgists, chemists, engineers and inspectors establishes standard practice procedures and testing requirements for every department. So highest quality is maintained.

THE OHIO STEEL FOUNDRY CO. LIMA, OHIO
PLANTS AT LIMA AND SPRINGFIELD, OHIO

Two different jobs use the same fixtures -- **500 MORE PARTS EVERY HOUR**



Webster-Chicago Speeds Production with **MULTIPRESS®**

In addition to raising production from 200 units per hour to 700 *per hour*—3½ times faster—this Multipress setup handles two completely different parts without any change whatsoever in fixtures and dies!

One part is handled by the day shift, the other by the night shift, producing an equal number of the two parts which are then fitted together in one of the high-precision three-speed record changers made at the famous Webster-Chicago plants.

In the operation, upright metal pins are staked to stamped plates—two pins in one part, three in the other—and the pins in the two parts are entirely different in spacing and arrangement.

The Multipress is a four-ton model, equipped with a six-station

Indexing Table toolled for the dual staking job. Ram tooling consists of a multiple-punch head with a spring stripper. Bottom dies, mounted at 6 stations on the index table, are also spring loaded, and equipped with guide pins that prevent either of the parts from being loaded incorrectly. The operator simply places the plates on the fixture and drops the required number of pins in place.

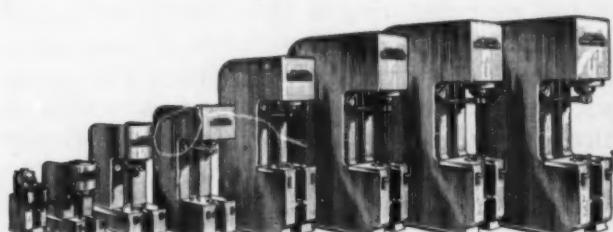
All punches in the ram tooling descend with each ram stroke, but only three make contact as the pins are staked in the first of the two plates. In processing the second plate, the other two punches are utilized. Both plates fit the same holding fixture.

A Plexiglas shield covers the front of the ram area across the entire table, with openings just large enough for

the loaded tooling fixtures to pass through. For additional safety, a microswitch arrangement shuts the press off instantly if a part is not properly set in the fixture.

A counting device attached to the head of the press is operated by an arm which strikes the tooling as it progresses toward the ram station. The ejection air blast is operated automatically in a similar manner.

The fast, smooth, accuracy of oil-hydraulic action is *made-to-measure* in Multipress for hundreds of different production jobs where more speed, precision, quality, safety and economy are desired. Multipress is available in 8 frame sizes, and in capacities from one to 50 tons. Many standard accessories for special needs. Write for information on Multipress and what it can do for you.



The DENISON Engineering Company
1158 Dublin Road Columbus 16, Ohio

 **DENISON**
HydroOILics

west coast progress report

*digest of
far west
industrial
activity*

by R.T.Reinhardt



Maybe More Pig—U. S. Steel officials are negotiating with Kaiser-Frazer Parts Co., owners of the 600-ton capacity idle blast furnace at Ironton, Utah, to lease or purchase the stack moved to the West from Joliet, Ill.

K-F operated the furnace for a short time during the tight pig market 2 years ago after purchasing it from the RFC. It is considered a high cost producer because of the lack of by-product coke ovens and has been operated on beehive oven coke. If U. S. Steel operates it through its Geneva subsidiary, coke from the Geneva ovens will probably be used.

Canadian Possibility—Announcement of a \$30 million development by Consolidated Mining and Smelting Co. of Canada, Ltd., involving initially two 102,500-hp generators and a dam, may indicate early entrance of this company into iron production.

Cominco has large reserves of tailings from its zinc mining operations which are high in both iron and sulphur and has been developing an electric furnace operation for the recovery of both. It is believed a commercially practical process has been found and that the additional electric power will be channeled into that project.

Another \$2,750,000 is to be invested in development of a new mine near Salmo, B. C., expected to produce in 2 years.

Neat Trick—Would-be black marketers in steel scrap in southern California are trying what appears to be a legal way to dodge ceiling prices.

Some consumers report offers by so-called "scrap procurement experts" to fill their requirements if they are hired at impressive salaries for short periods of time. No takers known so far.

Electric Grades Ease—While scrap generally remains tight, there has been some evidence of an easing in electric furnace grades. This is attributed in part to unusual activity of a few dealers who prepared quantities of this grade on the strength of rumors that OPS would allow increases in preparation costs. When such increases failed to materialize, dealers had to unload.

One electric foundry last week reported its highest scrap inventory in more than a year.

Kaiser Steel picked up more than 2800 tons of openhearth scrap in the purchase of about 70 electric trolley cars from the Pacific Electric Co. of Los Angeles which is switching to transportation by motor coaches.

Iron Foundries' Lament—Pig and coke shortages continue to beset western iron foundries. DO's bring out a little pig but don't help much on coke.

Pig is dribbling in from abroad.

Three vessels tie up in Los Angeles this week with 1500 tons of Dutch and Chilean pig to fill orders 6 months old. In the meantime, some foundries are down to 4 days' scrap supply.

Beating the Smog—Apex Steel Corp., Ltd., follows General Metals Corp. as the second foundry in Los Angeles County to get a clean bill of health from the strict Los Angeles County Air Pollution Control District. Its installation of baghouse filters has met requirements.

Columbia Steel Co. expects to have its two additional electrostatic precipitators installed at its open-hearths in Torrance by the end of June.

Metals Lead—The Los Angeles Chamber of Commerce reports that of the \$544,599,250 in private capital invested in Los Angeles County during the record breaking past 5 years, \$81,370,000 went into new plants and expansions in the metals field.

Aerojet Engineering Corp., with headquarters in Azusa, Calif., has begun construction of a \$6 million plant east of Sacramento; Osborne Machinery Co. of San Francisco has purchased the Malabar Jack Mfg. Div. of Menasco Mfg. Co. of Burbank; and the Friden Calculating Machine Co., Inc., is building a 43,000-sq ft steel frame structure in San Leandro for expansion of facilities.



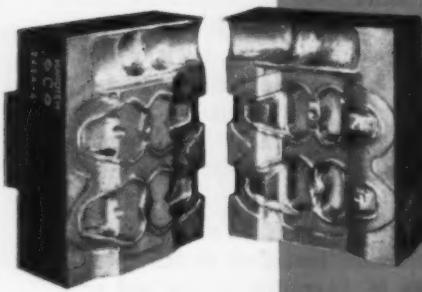
Of highest quality...

Heppenstall Hardtem Die Blocks

Experienced die block users know Heppenstall Hardtem . . . they know they can count on top quality, and get dependable blocks every time!

Made of Heppenstall's own special analysis steel, Hardtem Die Blocks are the result of the very highest degree of forging and heat treating skills. Regardless of size or shape, each block is quenched and tempered to the exact hardness required for a specific service application. Final supersonic tests make certain that every die block shipped is free from harmful defects.

To be sure of proved quality, and to get more forgings per block—just call on Heppenstall Heppenstall Company, Pittsburgh 1, Pa.
Sales offices in principal cities.



Heppenstall

...the most dependable name in forgings



the federal view

*this week in
washington*

by Eugene J. Hardy



DPA Fight Brewing—Hearings which opened this week on extension and revision of the Defense Production Act will touch off a bitter battle. Some provisions sought by the White House are viewed by business, industry, and some congressmen as a long step to socialism and nationalization.

Under present laws, for instance, the government can requisition real property under certain conditions. But current Administration proposals would give government arbitrary authority to take possession at once, upon filing a petition in any court, without hearings and without showing that the owner had ever refused to sell or that he had ever been approached.

The government also seeks the power to build industrial plants at will and at whatever location it wishes. No mention is made in either case of strategic considerations being necessary.

Federal Charter Up Again—Another revision of the DPA requested by the White House is somewhat more than reminiscent of the old Federal charter proposals. This one is feared by industry as much or more than the condemnation proposals.

It would provide authority for the government to institute Federal licensing as a means of enforcing pricing regulations. Thus, the way would be opened for forcing every business, from man-

ufacturing to retailing, to obtain a license as a condition to remaining in business.

Dangerous Powers—Power to suspend such licenses for a period of a year is sought, to be imposed upon no greater grounds than the White House has reason to believe a violation has occurred.

Of course, the arbitrary suspension would be subject to certain appeals—but in the meantime, the affected establishment would be out of business while the matter was being settled.

Experts' Suggestion—The industry advisory committee has recommended that the spread between cost and selling price be established as a certain percentage of the cost, primarily the mill base cost at the producing point.

It has further requested that prices be established f.o.b. warehouse and delivery charges from warehouses to customer for the customer's account.

Warehouse Price Order—OPS is still trying to work out a regulation that will take warehouse steel prices out from under the General Ceiling Price Regulation, but officials say that they are "unable to make any prediction as to the date of issuance."

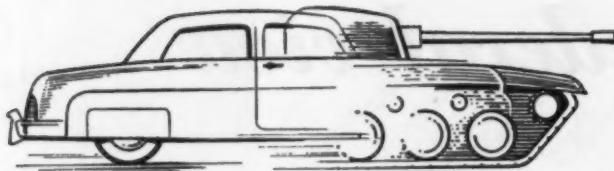
The problem is complicated by the change in steel selling methods since warehouse prices were controlled under RPS 49 by OPA.

At that time, there were uniform prices for products at specific basing points, but now there are varying prices at mill producing points with transportation for the account of the buyer. This results in a mill base cost delivered to a warehouse varying among warehouses in the same area.

Fast Tax Write-Offs—Further indication that Defense Mobilizer Charles Wilson's order to put the brake on free-handed issuance of certificates of necessity is having its effect has come to light.

Most types of applications already have been under much stricter screening and in some instances, such as for new steel plants, have come virtually to a standstill.

Cut-Off Date—However, the Petroleum Administration for Defense has ordered a cut-off date of Apr. 30 for such recommendations for certificates to oil refineries—that is, no application received after that date is to be considered for fast write-off. A basic reason is the growing tightness of structural types of steel. Another is that the applications approved to date already provide nearly 400,000 bbl a day, more than half the extra capacity now seen as needed by the end of 1952. This cut-off date, however, applies only to basic refineries and not to plants needed for special military requirements.



Safer Now to Buy Alloys on Hardenability

The defense program requires conservation of strategic metals—so, as in the last war, alloy steel analyses are changing. Some standard alloys are still available. But many new, or interim, analyses are already on the market. Others are on the way.

Today more than ever, under these changing conditions, the safest way to buy alloys is on the basis of analysis *and* hardenability rather than on analysis alone. When we know the hardness or tensile strength you need, we make absolutely sure that the alloy you receive meets your requirements—even though it will be many months before standard hardenability ranges of the new steels are established. Here is how we do it:

We carefully test each and every heat of as-rolled and annealed alloy steel in our stocks.

This gives us actual knowledge of the hardenability of every bar of Ryerson alloy. Thus when you specify on a hardenability basis you can be sure the alloy you get from Ryerson will meet your requirements. And you can also be sure of getting the desired heat treatment results because the test information and other helpful data to guide you come with the steel.

Not every company makes these tests, records this information, but Ryerson does—and at no extra cost to you. It's all part of a service system called the Ryerson Certified Steel Plan. So during this confusing period, order by AISI and SAE number if you wish but also specify hardenability and be doubly sure. Though some shortages are inevitable, we will do our level best to supply the alloy steel you need.

PRINCIPAL PRODUCTS

ALLOYS—Hot rolled, cold finished, heat treated. Also tool steel

CARBON STEEL BARS—Hot rolled and cold finished

STRUCTURALS—Channels, angles, beams, etc.

PLATES—Many types including Inland 4-Way Safety Plate

Sheets—Hot and cold rolled, many types and coatings

TUBING—Seamless and welded, mechanical and boiler tubes

STAINLESS—Allegheny bars, plates, sheets, tubes, etc.

BABBITT—Five grades, also Ryertex plastic bearings

MACHINERY & TOOLS—For metal fabrication

RYERSON STEEL

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • PHILADELPHIA • CINCINNATI • CLEVELAND
DETROIT • PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO

Explosion test

USED IN WELD STUDIES



Explosion bulge tests offer advantages in simplicity of equipment and experimental procedures as a means for testing welds under controlled biaxial stress conditions. Various types of welds were tested with both circular and ellipsoidal bulges. The concepts of weld-deformation mechanics deduced from the bulge studies were found to be general to weld performance, not specific to high rates of loading.



By **W. S. Pellini**, Head
and **C. E. Hartbower**, Metallurgist
*Metal Processing Branch Metallurgy Div.
Naval Research Lab. Washington*

Simple uniaxial stress conditions seldom prevail in complex rigid frame structures such as ships, bridges and pressure vessels. Regardless of the gross conditions of loading, the design engineer is ordinarily faced with vector resolutions of loads involving either biaxial or triaxial stress fields.

Triaxial tensile stress fields increase flow resistance and decrease ductility. The effects are pronounced even at low average levels of triaxiality. The unfortunate requirement of a notch has tremendously complicated the interpretation of "triaxial" tests. To date, the factors which determine the degree of triaxiality of notch

tests have not been resolved. It is therefore impossible to designate material properties in terms of definite triaxial stress conditions.

Very little is known of the performance of full welds except in simple uniaxial tension. Even the most approximate form of empirical correlation between the performance of notched weld tests and full welds in service is impossible.

Hatch corner and box girder investigations, with the related notched, bead-on-plate weldability test studies, represented a specific type of strictly empirical approach to the performance of full welds in ship hull structures. The correlations from these studies have been largely

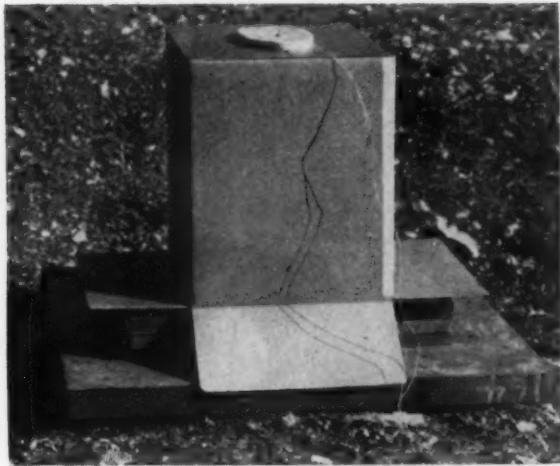


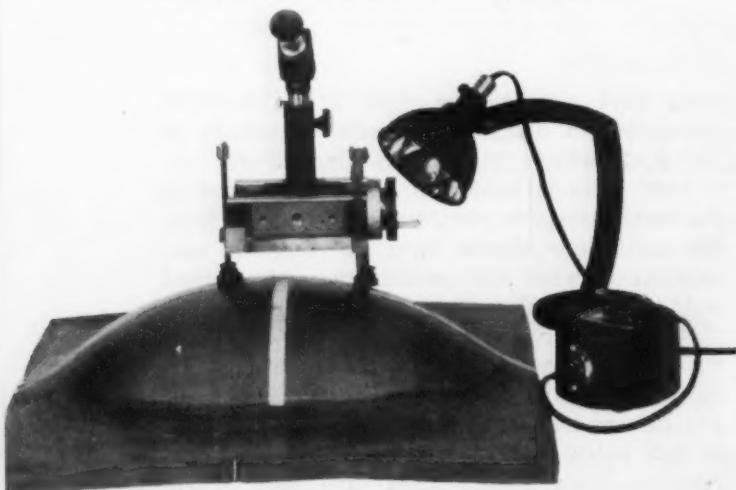
FIG. 1—The circular charge wafer is suspended at the proper standoff by means of the pasteboard box, and then detonated with an electrical primer.

Explosion testing (continued)

inconclusive, owing partly to the few structural tests which were performed and partly to the complexity of the performance interpretations required.¹ One of the real needs of the welding field is a relatively inexpensive structural test of full joints featuring a simple geometry which will permit testing under controlled loading conditions.

A limited study of the performance of longitudinal and circumferential welds joining tubular sections of $\frac{3}{4}$ in. mild-steel plate was made in prior investigations² of the performance of welds in controlled biaxial-load fields. Tubes of sufficient size (20-in. diam) to incorporate full welds in $\frac{3}{4}$ in. ship plate required special testing equipment; experimental difficulties arose from premature failures at or near the end connections. Tube tests are expensive and have been limited to fundamental research in the field of applied mechanics.

FIG. 2—Measurement of photogrid distortions on the bulged test plate are made with a microscope mounted on a micrometer slide. The grid contains 20 lines per in.



Advantages of bulge tests lie in the simplicity of equipment and experimental procedures. The bulge test has been used by a number of investigators for studying the flow and fracture of metal sheets under combined stresses.^{3,4} Bulges are ordinarily produced by hydraulic pressure applied to a test diaphragm clamped over a circular or elliptical opening.

Spherical bulges represent a condition of balanced biaxial stress; the stress in ellipsoidal bulges is unbalanced with the major stress in the minor axis direction and the minor stress in major axis direction. The degree of stress unbalance developed in ellipsoidal bulges is a function of the relative ratios of the two principal axes of the ellipse, but is not in exactly the same numerical ratio.

Bulge tests of thick plates develop bending conditions giving rise to a reaction stress component in the thickness direction. Although the value of this third stress component cannot be determined directly, it is considered minor in comparison to the two principal stresses in the plane of the plate. The important feature is that performance of the full weld may be evaluated in terms of exacting control over two of the three principal stress directions.

Standoff minimizes shock wave

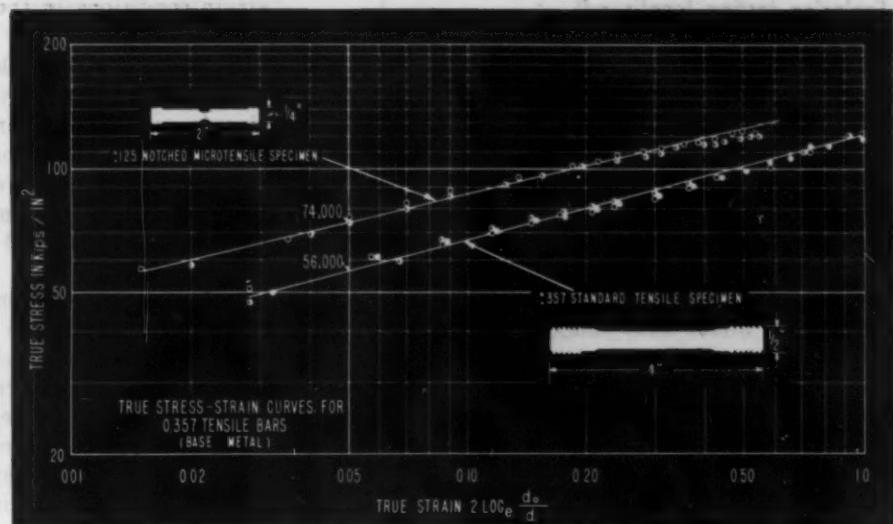
The controlled biaxial stress conditions made possible by bulge tests and the simplicity of the test weldment provide the desired features of a semi-works-scale test if sufficient force can be developed for bulging heavy-plate weldments. Snellings' procedures for direct explosion testing^{5,6} demonstrated that explosives could be utilized for such a purpose. Contact explosion, however, does not provide the uniform loading required for a true bulge test. Recourse can be made to offsetting the explosive and shaping the charge to a wafer, providing a flat explosion wave of uniform intensity.

Removing the explosive from direct contact with the test plate minimizes the shock wave or brisance effects of explosives which are inherently variable and difficult to control. With standoff, the effect of the explosive is primarily that of rapid loading by very high gas pressure. The gas pressure from an explosion is inherently more reproducible and requires a minimum of procedural control. Contact explosion conditions, on the other hand, require exacting brisance control, which can be obtained only with specialized explosives.

A standard military explosive (demolition Block M3 Composition C3) was used. This explosive, which has the appearance and consistency of wax, is shaped to a circular or elliptical wafer of approximately the size and shape of the opening in the die. In the present investigation, the bulges were formed at 60°F using 4 lb of explosive at 12 in. standoff.

The test weldment, consisting of a 20 x 22 in. plate produced by butt welding two 10-in. wide

FIG. 3 — Comparison of base metal flow curves, illustrating the effect of the notch in introducing triaxiality and raising on flow strength.



plates, was placed over a circular ($r=6$ in.) or elliptical ($a=7.5$ in., $b=4.8$ in.) opening cut in a 4-in. thick armor saddle plate. The die opening was chamfered to provide smooth entry of the bulge into the die cavity. The explosive wafer was then located at the required standoff. An expendable pasteboard box was used as a support, as shown in Fig. 1.

Detonation was by means of an electrical primer. The unsupported area of the plate was approximately 28 pct of the total area; the remainder of the plate was effectively clamped to the armor die by the gas pressure of the explosion, thus providing the required hold-down without need of a bolting ring. The effectiveness of the hold-down was evident from observation of bulged plates, which remained very nearly flat over the supported area.

Perfect weld challenged

A theoretically perfect weld required (a) exact matching of mechanical properties between weld deposit, heat-affected zone (HAZ), and base material, and (b) freedom from flaws. This general premise is presently challenged by some investigators on the grounds that it is not realistic to expect attainment of this double goal in practice. A solution has been proposed entailing the use of weld deposits which overmatch the flow strength of the parent plate, and feature high notch toughness. The bulge test was directed to a study of this problem.

Basic information was first obtained on distribution of plastic deformation over the entire weld-joint zone of matching and overmatching weld deposits. The studies included balanced (1:1) and unbalanced (0.8:1) stress fields, with weld orientations varied relative to the major stress in the case of the unbalanced stress fields. Tests were also performed on prime plate material to provide a reference strain-field condition. All strain measurements were made at arbitrary levels of general strain well below the critical strain producing fracture.

The material used was taken from a single heat of commercial silicon-killed firebox steel plate, $\frac{3}{4}$ in. thick, ordered to specification A201 Grade A. Tensile strength was 64,380 psi, yield point 38,540 psi, and elongation 29.9 pct. Chemistry was as follows: 0.18 pct C, 0.44 pct Mn, 0.24 pct Si, 0.013 pct P, and 0.039 pct S.

A special research-type single-pass butt weld with heat-affected and fusion-zone demarcation lines vertical with respect to the plate surface was made. Thus, any cross section parallel to the weld would contain a single microstructure and would be a plane of uniform physical properties. The electrode produced a low-alloy deposit (0.13 pct C, 2.0 pct Mn).

For comparison with the research-type submerged-arc weld, a manual-multipass, E12016, butt weld was tested with a geometry similar to that commonly used in ship construction. The plate edge preparation consisted of a 60° double-V joint.

Strains were determined by measuring the distortion of a grid containing 20 lines per in., applied to the test plate by a photogrid process. Measurement of grid distortions was accomplished by means of a microscope mounted on a micrometer slide which in turn was supported by three adjustable legs as in Fig. 2. Gage length used throughout the study was 0.100 in.

Welds modified strain characteristics

The discussions which follow have been restricted to the conditions of strain state and absolute strain level at the pole of the bulge. The pole is defined as the region at the apex of the bulge which does not show strain distortions arising from hold-down or edge effects.

Distribution of strain in unwelded plate is presented schematically in the upper right-hand corner of the figures presenting weld strain distributions so that direct evaluation may be made of the effect of the presence of the weld. The squares and rectangles of the schematics are scaled to represent grid distortion; squares indi-

Explosion testing (continued)

cate equal extensions in all directions and rectangles indicate greater strain in the one direction.

In unwelded plate, the elliptical die developed a bulge having an unbalanced biaxial strain field of 1:2 (0.050:0.100) ratio. If the plate is considered essentially isotropic, the stress field is then on the order of 0.8:1, i.e., the stress along the major axis is 0.8 of the stress along the minor axis. The component of the strain parallel to the minor axis (major strain) is designated as e_1 , and the component parallel to the major axis (minor strain) as e_2 .

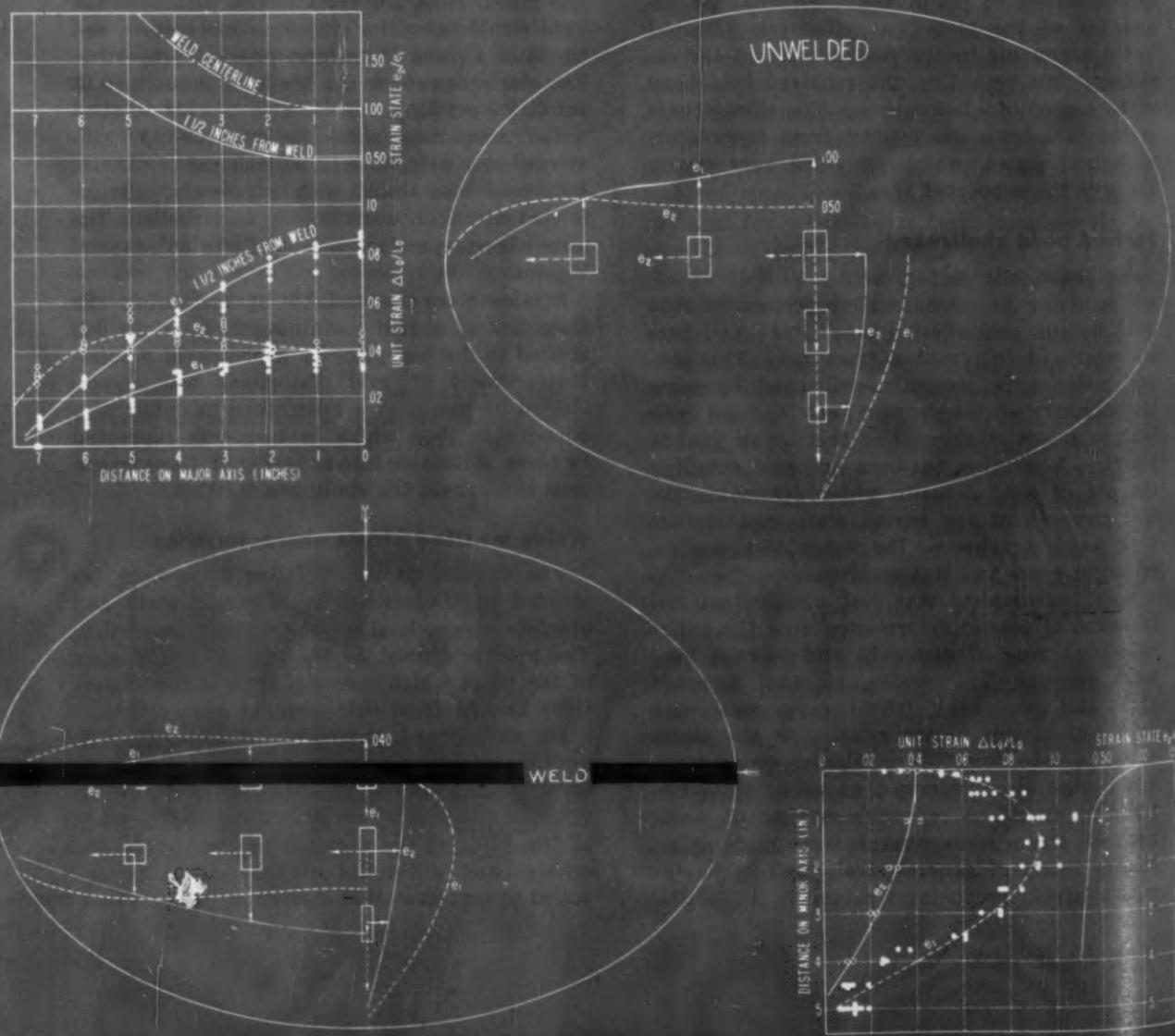
The introduction of welds generally resulted in marked modification of the strain characteristics in the weld and near-weld regions as compared to the same position in the unwelded bulges. The plate regions removed from the weld zone, however, matched the strain characteristics of the unwelded bulges. Modifications of strain fields in the weld and near-weld zones indicated concomitant modifications of stress fields. Thus, the stress-strain conditions in the weld-joint area may differ considerably from the imposed stress-

strain conditions in the homogeneous portion of the bulge.

As part of the problem of interpreting the deformation characteristics of welds, information is required concerning the individual flow properties of the various components of a weld joint. Inasmuch as there is no established method for testing the very small volumes of metal involved, a small notched tensile specimen was designed, together with a contractometer device for obtaining continuous readings of the reduction in diameter at the base of the notch.

By means of the notched specimen, it was possible to obtain true stress-strain curves of small volumes of metal on the order of 0.002 cu in. The effect of the notch in introducing triaxiality and thereby raising flow strength may be deduced from Fig. 3, which presents comparison base metal true stress-strain flow curves as determined with a standard 0.357-in. tensile specimen and with the notched microtensile specimen. The intrinsic strength properties of the weld-joint zones are summarized in the accompanying table as relative levels of flow strength at a fixed level of strain, arbitrarily chosen as 0.05 strain.

FIG. 4—Strain distribution in a bulge containing a high-strength butt weld made with an E12016 electrode. The strain ratio of the unwelded bulge was modified as a result of deconcentrations of the major strain.



RELATIVE FLOW STRENGTH*

Material	Flow Strength, 1000 Psi	Overmatch, Pct
Firebox plate	74	....
Maximum HAZ	78	8
Low-alloy deposit	81	10
E12016 deposit	140	90

* Of weld joint zones (psi at 0.05 strain).

The low-alloy submerged-arc weldments consisting of a single-pass, square-sided, butt weld with reinforcement ground flush were tested in three conditions: (1) Balanced biaxial stress; (2) unbalanced biaxial stress with weld perpendicular to principal stress; and (3) unbalanced biaxial stress with weld parallel to principal stress.

These weldments represented close matching of weld-joint and prime-plate flow strengths. As listed in the table, the weld deposit and HAZ exceeded the plate flow strength by only 7000 and 4000 psi respectively. This very small difference in relative flow strengths was sufficient to decrease or deconcentrate strain from the weld region in a direction transverse to the weld in each of the three tests.

The normal balanced (0.070:0.070 ratio) strain condition produced in the unwelded circular bulge was unbalanced to a 0.040:0.070 ratio by the presence of the weld. The change to an unbalanced strain field in the weld denotes a change in the stress field from the imposed balanced biaxial stress to unbalanced biaxial stress with the major stress in the weld longitudinal direction. It is surprising that the strain deconcentration effects extended into the unaffected prime plate approx 1/2 in. beyond the edge of the HAZ.

Weld overmatched prime plate

E12016 weldments consisting of multipass, double-V, butt welds with the reinforcement removed were tested in unbalanced tension with the weld oriented parallel and perpendicular to the principal stress direction.

This weld represents considerable overmatching of the prime plate. The weld flow strength at 0.05 strain exceeded that of the plate by 66,000 psi (140,000 psi vs 74,000 psi). Severe deconcentration effects were noted in the transweld direction of both tests performed. In the case of the major stress acting across the weld, Fig. 4, the 1:2 (0.050:0.100) strain ratio of the unwelded bulge was modified to 1:1 (0.040:0.040) balance as the result of deconcentrations of the major strain.

In the case of the minor stress acting across the weld, the minor strain was reduced from 0.050 (unwelded) to 0.015; thus, the strain unbalance changed from 1:2 (unwelded) to approx 1:7 (0.015:0.100). In either case, the strain along the weld was not significantly changed from the values noted for the unwelded plate in corresponding positions and directions.

A strain survey made 1 1/2 in. from the weld and parallel to the weld, Fig. 4, further substantiates this conclusion. The strain deconcentration effect of the weld extends into the unaffected base plate for a distance of approx 1/2 in. beyond the edge of the darkly etching HAZ.

A generalized analysis of the strain distributions of closely matching and overmatching welds in biaxially loaded stress fields indicates a basic pattern. The presence of an overmatching weld results in marked modification of the strain field not only in the weld deposit and HAZ zones but also outward into the unaffected base material. The change in the strain field caused by an overmatching weld is determined by a deconcentration of the strain component transverse to the weld. Weld strains in the direction of the weld length are not significantly affected.

Orientation determines values

Orientation of the overmatching welds in unbalanced biaxial load fields determines the maximum and minimum values of the greatest deformation (principal strain) developed in the weld. A maximum value is reached when the weld is oriented in the direction of the major stress, and is always along the length of the weld regardless of overmatch characteristics.

A minimum value of the principal strain is reached when the weld is oriented in the direction of the minor stress. The strain modifications observed in the weld and near-weld zones may be translated in terms of modifications in stress fields.

Generally, in keeping with the noted changes in strain fields, (a) an overmatching weld in balanced biaxial loading will develop highly unbalanced biaxial stress conditions, and (b) an overmatching weld in unbalanced loading will approach stress balance and may even produce a complete reversal of the direction of major stress if the weld is placed in the direction of the minor load, or develop increased stress unbalance if the weld is placed in the direction of the major load.

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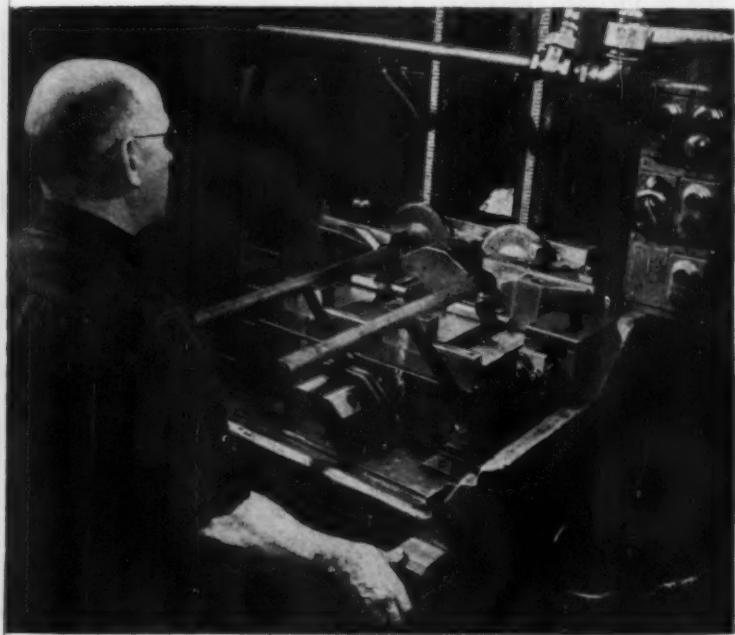
HOW LINCOLN-MERCURY MACHINES

Though forgings used are similar, some Lincoln-Mercury rear axle shaft machining methods differ from those used elsewhere. Fewer machines yield higher output than in some parallel cases. Excellent tooling includes many solid carbide bits, and special designs.

Rear axle shafts for Lincoln and Mercury cars are produced from forgings similar to those for other cars, but several of the setups employed differ from those used elsewhere. Results attained are excellent, close limits being held and a superior finish attained.

Shafts are forged from SAE 8630H, 1330H or 5130H steel, the forgings being hardened to 321 to 383 Bhn and straightened at the Ford forging plant in Canton, O. These are shipped on pallets holding 240 pieces, to the Lincoln-Mercury plant, Detroit, for machining.

FIG. 2—Setup for broaching drive slots across the cupped hub flange, two at a time. Both the machine and the fixture clamps are hydraulically operated.



Here forgings are checked for runout and any shafts not within limits are shunted to a press for straightening. First machining is done on a 48-in. Ductomatic broach hydraulically operated and equipped with two hydroclamping fixtures that are loaded simultaneously. Fixtures are on a table that moves in before the two broaches make their $\frac{3}{4}$ -in. wide cut and retracts immediately the driving slots across the end of the cupped flange hub are completed, the machine cycling automatically when starting buttons are pressed. Two hundred and ten pieces an hour are broached in this machine.

Broached forgings then go to two double-end Davis & Thompson automatic chain clamping machines and are set by hand in the vee slots of the drum self-equalizing fixtures that carry the shafts through the machine. The first station operation is drilling centers in both ends. Machine also has carbide milling cutters that rough and finish the spline ends. Location endwise is from the slot previously broached. About $\frac{1}{32}$ to $\frac{1}{8}$ in. of metal is removed, and 820 shafts are machined per grind of the cutters.

Air jets cool tools

Centers are produced by a special drill which is T-5 tungsten-cobalt high-speed steel. A jet of air is used to cool the carbide cutter on the spline end, while regular coolant is used on the flange end. Production rate on each of these machines is about 124 shafts per hr.

Shafts are removed by hand and hung on a chain conveyer that takes them to one of four Bullard Man-Au-Trol horizontal lathes. Each of these handles three shafts at a time, and despite the number of operations performed, turns better than 45 shafts an hr. All roughing of flange is done by tools of circular section. Tools of

AXLE SHAFTS

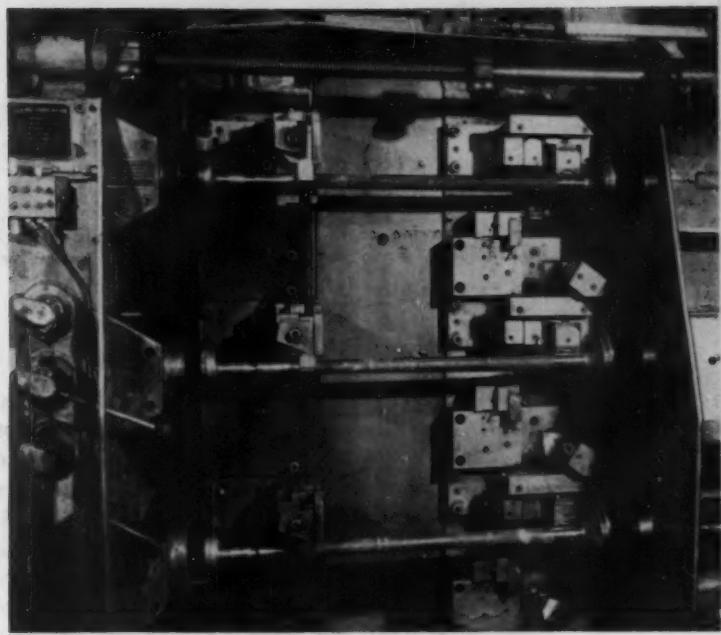


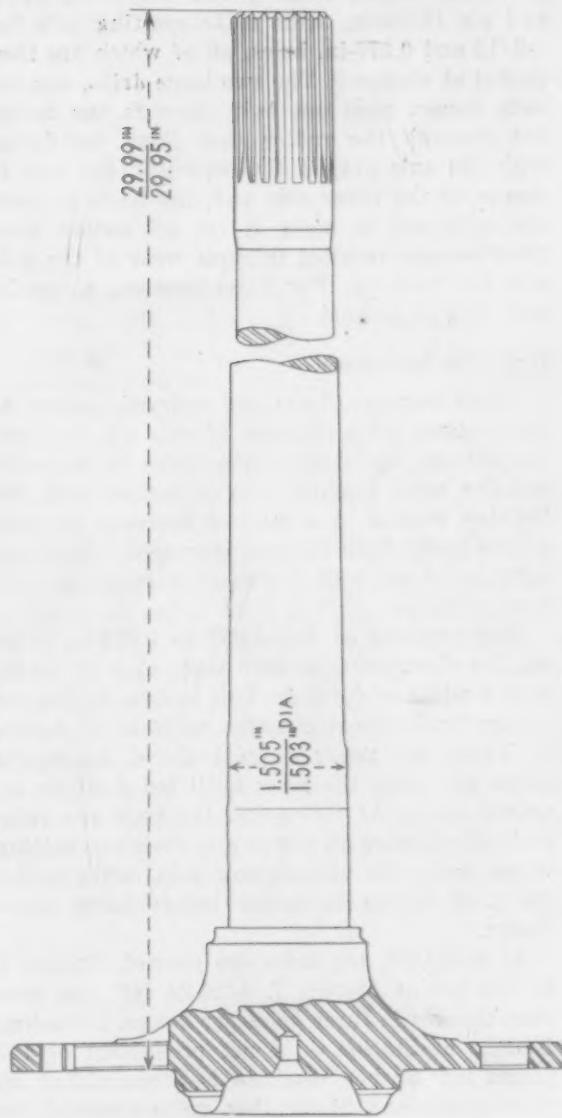
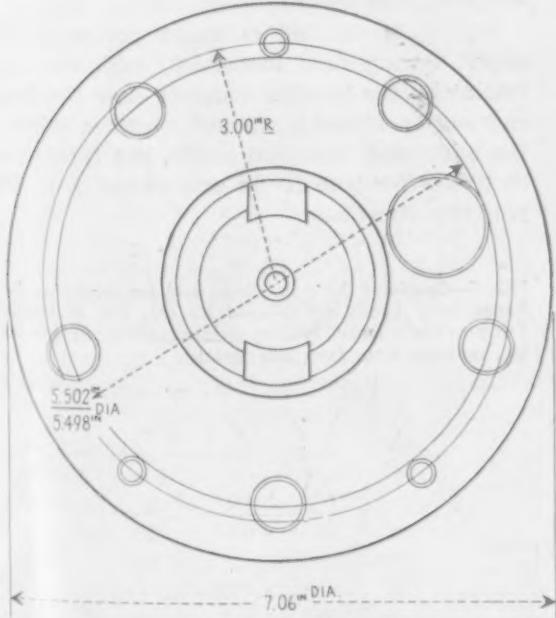
FIG. 3—Three shafts in the Bullard horizontal lathe, above, as they appear after several turning and facing operations have already been performed.

diamond and triangular shape make finishing cuts.

The solid carbide tool for rough turning the bearing and oil seal diameters, Fig. 4, has its radius generated rather than being ground parallel. This avoids such chipping as might affect the whole length of the tool. All bits are given a 7° negative rake, with chip breakers.

After machines are loaded and guards are closed, the entire series of operations is automatic. Only one tool per shaft cuts at a time, hence there is no interacting effect. Because of the large difference between the diameters, the rotary speed of the shaft is changed automatically to provide a favorable cutting speed.

FIG. 1—The axle shaft for Lincoln and Mercury automobiles.



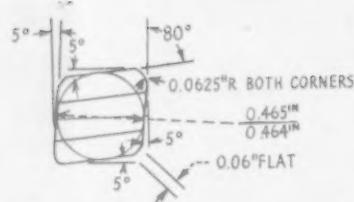
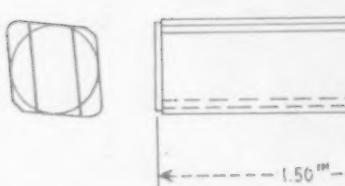


FIG. 4—Drawing of the tool for rough turning bearing and oil seal diameters in the Bullard lathe. Radii are generated rather than ground longitudinally on this solid tool.

Machining axle shafts (continued)

Finish turning of the bearing and oil seal diameters and chamfering of the spline end of the shaft are performed on four Sundstrand lathes. After leaving the Sundstrands, shafts are transferred to two Davis & Thompson 8-station vertical drilling machines equipped to handle two shafts at each station. Shafts are held vertically in air-operated chucks that are indexed around the machine between drilling, reaming, tapping and chamfering operations on flange holes. Five 37/64-in. holes per piece are drilled at the first station.

At the second station, two 1-5/16-in. drills and six 15/32-in. drills make spotting cuts for 1-3/16 and 0.277-in. holes, all of which are then drilled at station 3. The two large drills, one for each flange, pass not only through the flange but through the radius that joins the flange with the axle proper. Consequently, the hole is deeper at the inner side and this tends to bend the drill and to make it cut off center. Side pressure also resulted in rapid wear of the drill and the bushing. For these reasons, a special drill, Fig. 5, is used.

Drill life increased

Lands between flutes are relieved, except at their edges, for a distance of only 1½ in. from the cutting lip. Above this, there is no relief and the extra bearing area in contact with the bushing results in a marked decrease in wear on the lands. Drill life was increased from about 2400 to about 9000 holes as a result of this change.

Specifications on five 0.600 to 0.602-in. holes call for chamfering at both ends, at a 45° angle with a width of 0.060 in. This is done by the use of ten Scully-Jones chamfering tools at station 4. These are really form tools of hour-glass shape and clear the holes until fed down to required depth. At this point, the tools are automatically thrown off center and their two cutting edges make the chamfering cuts, after which the tools return to center before being withdrawn.

At station 5, ten holes are reamed. Station 6 is idle but at Station 7, 5/16-24 NF taps produce threads in three holes per flange. Unloading is done at Station 8. A net production of 117 pieces per hr per machine is accomplished on these operations. Shafts then go to a special Lee

two-spindle drill press in which the large holes are counterbored and countersunk. This machine has two fixtures that are used alternately, one being loaded while operations proceed at the other. Output is 223 pieces per hr.

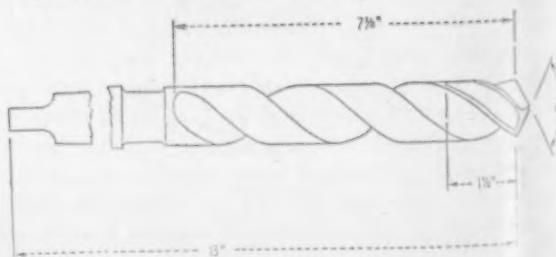
Hobbing of the involute splines is done on four 8-spindle Cleveland machines with work held vertically on centers. Each of these machines has a circular table that rotates slowly and continuously as the hobbing proceeds. By the time one revolution of the table is made, the hobbing on the shaft that arrives at unloading position is completed and the shaft is removed and another is put in place. Each machine handles 62.5 shafts per hr. Hobs make climb cuts and unusually smooth splines result. A spring loaded steady rest just below the spline practically eliminates chatter.

Oil seal lapped

From the hobbing operation, shafts go to two Cincinnati centerless grinders that finish grind the bearing diameter to 1.5325 to 1.5319-in. and the oil seal diameter 1.505 to 1.503-in. These machines handle about 70 pieces an hr each. Remaining production is on two Norton and one Landis cylinder grinders as the schedule requires. Shafts next go to two Schrader lapping machines where the oil seal diameter is lapped at the rate of about 96.6 pieces an hr each. This completes the machining.

Runout is checked at seven points by dial gages, during final inspection, with the shaft resting on the bearing diameter near the flange end and on a bushing placed over the spline at the other end. Accepted shafts are then placed on pallets for transfer to axle assembly or shipping departments.

FIG. 5—Special 1 3/16 in. diam. drill for producing large flange hole. Lands are relieved for only 1½ in. from lip. This provides a larger bearing surface against the drill bushing, reducing wear from side thrust.



Room temperature mechanical properties of Inconel X changed little after heating at 900°F for up to 1000 hr. Strength of Stainless W increased up to 700°F but 4340 decreased at this same temperature. In cases the impact properties of Stainless W were 60 to 170 pct higher at 700°F than at room temperature.

Navy studies JET

STRUCTURAL ALLOYS

at intermediate temperatures



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Experimental data indicate that, because of aerodynamic heating incident to the operation of piloted and pilotless aircraft at supersonic speeds, ultimate tensile strength of 200,000 psi probably will be required of metals used in such aircraft.

For this reason an investigation was performed on materials heat treated to ultimate strength of 200,000 to 220,000 psi.

Mechanical properties, impact and hardness values, and certain fatigue characteristics of SAE 4340 steel, Inconel X and Stainless W steel were investigated at (1) room temperature, (2) to 700°F, and (3) 900°F, for various periods of time, up to 1000 hr. The stress-rupture, creep and certain endurance characteristics of SAE 4340 and Stainless W steels at 700°F and Inconel X at 900°F were also studied.

Each material was representative of the type required for this investigation, as shown by the chemical compositions and specifications of Table I. The room temperature tensile and impact properties of Inconel X alloy showed no substantial changes due to heating at 900°F for 1, 10, 100, 500 and 1000-hr periods of time, Table II and Fig. 1. Fig. 2 illustrates the microstructure of Inconel X after heating at 900°F for

the various periods.

The microstructures reveal the alloy to have equi-axed grains with twinned grains predominating. This alloy was furnished in the condition (hot-rolled and aged) most suitable for applications and testing below 1200°F. The ultimate strength of the alloy was 178,000 psi as a result of hot rolling and then aging at 1300°F for 20 hr.

The room temperature tensile and impact properties of Stainless W, after heating at 700°F for 1, 10, 50, 100, 500 and 1000-hr periods, Table II and Fig. 3, show that the hardness, also the tensile and yield strengths, increase and the corresponding impact strength and ductility decrease progressively. This effect is due to the precipitation of carbides at the grain boundaries.

The room temperature tensile and impact properties of SAE 4340, after heating at 700°F for 1, 10, 50, 100, 500 and 1000-hr periods, Table II and Fig. 4, show that the tensile and yield strengths decrease slightly with little

TABLE I

CHEMICAL COMPOSITIONS

Material	C	Mn	S	P	Si	Ni	Cr	Fe	Ti	Cb	Al	Cu	Mo
Inconel X	0.05	0.45	0.005	.....	0.42	72.20	14.18	8.95	2.38	1.11	0.86	0.10	.....
Stainless W	0.07	0.52	0.009	0.024	0.58	8.56	18.87	.....	0.51	.....	0.15	.....	.....
SAE-4340	0.37	0.80	0.021	0.014	0.21	1.75	0.74	Bal.	.....	.....	.....	.....	0.23

Structural jet alloys (continued)

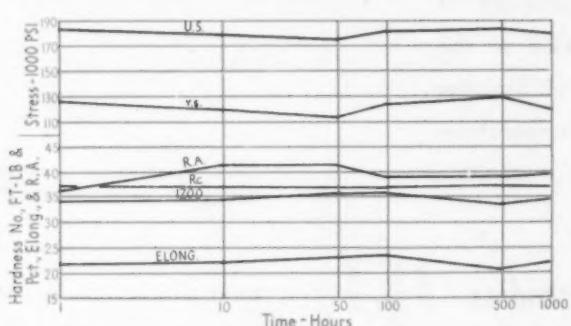


FIG. 1—Room temperature mechanical properties of Inconel X after heating to 900°F.

change in ductility and impact strength as the time at temperature is increased. This can be attributed to internal stress relief, because of the relatively small reduction in hardness as well as little or no change in the respective microstructure for the various periods of time at temperature.

The ultimate tensile strengths of Inconel X, Stainless W and SAE 4340 showed 6.3, 17.8 and 27.1 pct reductions, respectively, from room temperature values when tested at 900°F, 700°F and 700°F, respectively, Tables III and IV.

From an examination of the impact test data on Stainless W, the sample aged at 950°F for 30 min, tested at 700°F, showed an approximate 60 pct increase in impact strength over the same

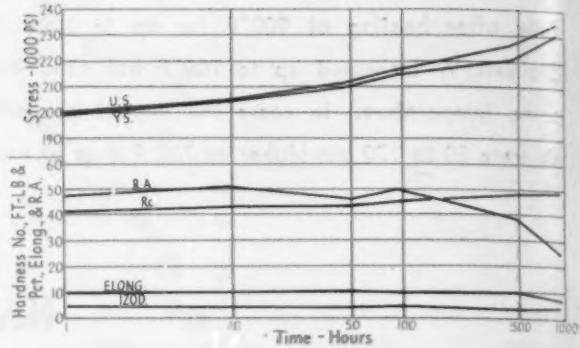


FIG. 3—Room temperature mechanical properties of Stainless W after heating to 700°F.

condition tested at room temperature. The sample aged at 950°F for 30 min plus 700°F for 1 hr, tested at 700°F showed an approximate increase of 170 pct in the impact strength over the same condition tested at room temperature.

Inconel X was found to have a higher resistance to rupture at 900°F than Stainless W and SAE 4340 at 700°F, Fig. 5. Inconel X also had a higher resistance to creep at 900°F than Stainless W and SAE 4340 at 700°F, Fig. 6 and Table V.

The reversed bending endurance limit, endurance strength at 5000 cycles and endurance life at 135,000 psi of Inconel X were reduced 11.0 pct, 16.0 pct and 81.0 pct, respectively, from the corresponding room temperature values, when

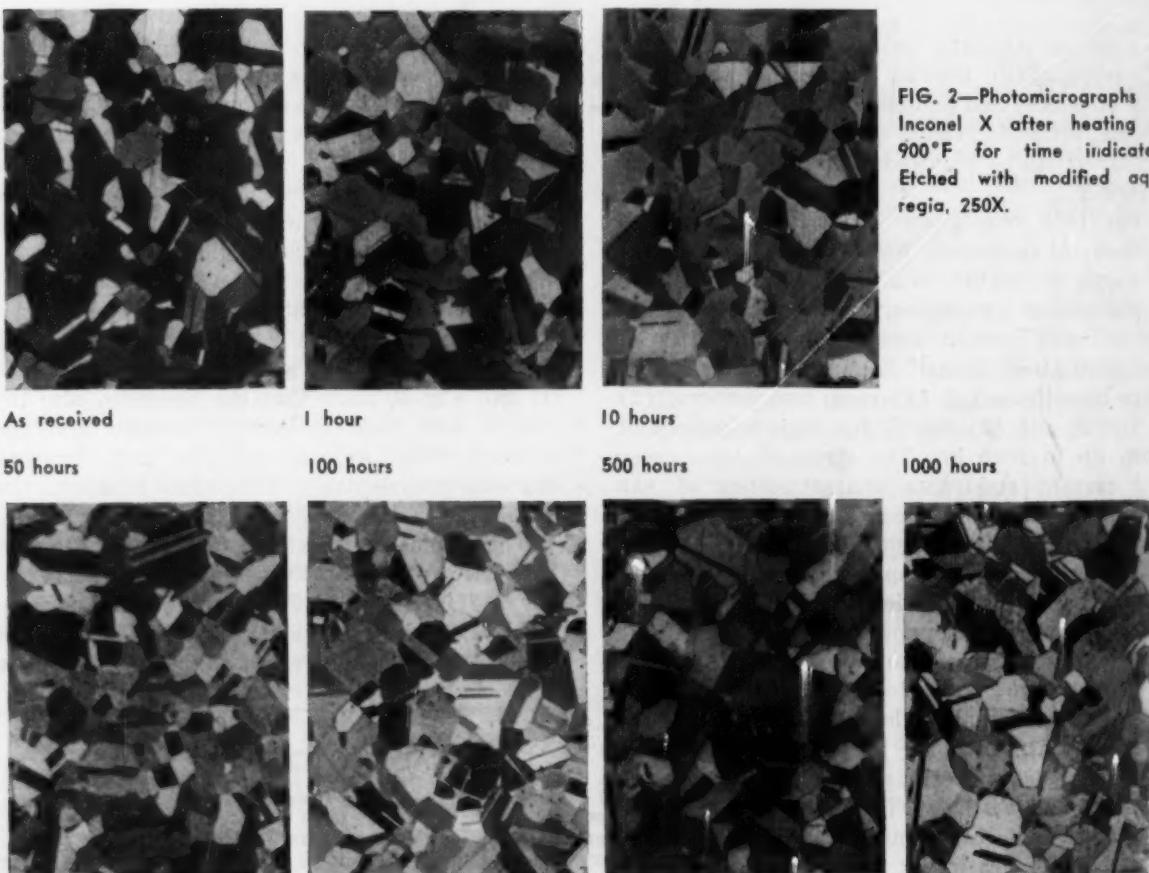


FIG. 2—Photomicrographs of Inconel X after heating at 900°F for time indicated. Etched with modified aqua regia, 250X.

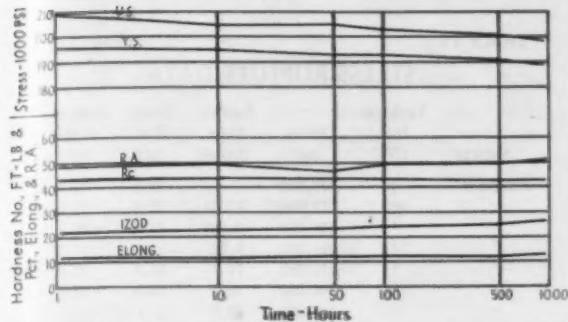


FIG. 4—Room temperature mechanical properties of 4340 after heating at 700°F.

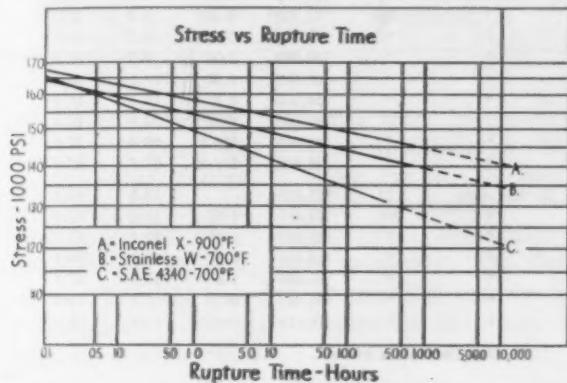


FIG. 5

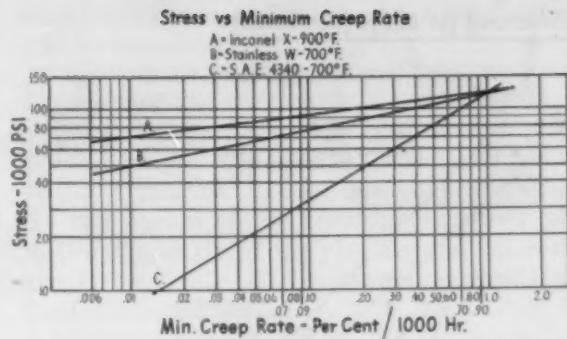


FIG. 6

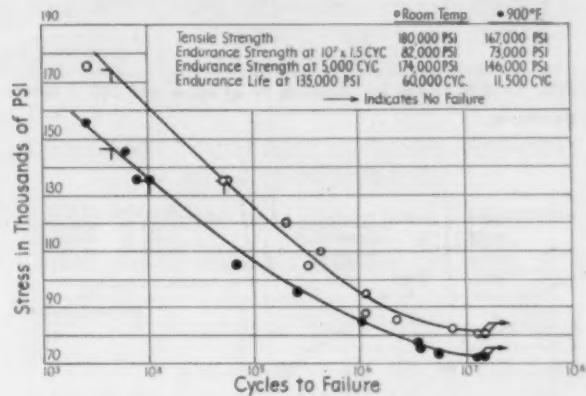


FIG. 7—S-N curves for Inconel X at room and 900°F temperatures.

tested at 900°F, Tables VI and VII. These two tables also show that the reversed bending endurance limit, endurance strength at 5000 cycles and endurance life at 135,000 psi of Stainless W were reduced 3.1 pct, 12.2 pct and 70.6 pct,

respectively, from the corresponding room temperature values, when tested at 700°F.

Reversed bending fatigue (S-N) curves, for room and elevated temperatures, for Inconel X, Stainless W and SAE 4340 steel are shown in

TABLE II
MECHANICAL PROPERTIES AT ROOM TEMPERATURE

Condition	Inconel X						
	Ultimate Strength psi	Yield Strength (1) psi	Elong. pct	Reduction of Area, pct	Modulus X10 ⁻⁶ psi	Izod Impact Value ft-lb	Hardness (2) Re Ra
As received	178,340	119,070	22.8	39.2	31.0	36.5	37.0 69.0
Heated at 900°F for 1 hr.	182,670	125,750	21.2	38.0	30.8	34.0	37.0 68.5
Heated at 900°F for 10 hrs.	181,080	120,290	22.0	41.5	31.6	34.5	37.0 69.0
Heated at 900°F for 50 hrs.	178,670	114,700	23.2	41.6	30.4	36.0	37.0 69.0
Heated at 900°F for 100 hrs.	182,700	125,540	23.7	39.3	30.7	36.0	37.0 68.0
Heated at 900°F for 500 hrs.	185,420	131,250	21.0	39.5	31.9	34.0	37.5 69.0
Heated at 900°F for 1000 hrs.	182,330	121,920	22.5	40.0	31.2	35.0	37.5 69.0
<hr/>							
Stainless W							
As Received	134,500	128,330	14.7	67.0	28.3	73.0	29.0 64.0
Aged at 950°F for 30 min.	198,900	197,300	12.0	52.4	30.1	5.5	41.0 71.0
Heated at 700°F for 1 hr. (3)	202,470	200,800	11.7	49.8	29.4	6.5	43.5 72.0
Heated at 700°F for 10 hrs. (3)	206,070	205,200	10.7	51.8	29.1	5.0	44.0 72.0
Heated at 700°F for 50 hrs. (3)	211,400	209,800	10.5	46.1	29.4	4.0	43.5 72.5
Heated at 700°F for 100 hrs. (3)	216,200	214,000	9.5	49.5	30.8	4.0	45.0 73.0
Heated at 700°F for 500 hrs. (3)	225,000	219,400	8.3	37.5	29.8	2.0	47.0 74.0
Heated at 700°F for 1000 hrs. (3)	233,300	229,300	5.3	23.1	29.5	2.0	47.0 74.0
<hr/>							
SAE-4340							
As Heat Treated	210,830	198,750	12.3	53.0	29.8	22.0	44.0 72.0
Heated at 700°F for 1 hr. (4)	210,330	196,900	12.5	51.3	29.4	23.0	44.0 72.0
Heated at 700°F for 10 hrs. (4)	208,800	195,400	11.8	51.0	29.2	23.0	41.0 72.0
Heated at 700°F for 50 hrs. (4)	205,600	193,330	12.0	48.4	29.1	23.5	43.5 72.0
Heated at 700°F for 100 hrs. (4)	203,000	192,500	12.0	50.8	29.4	24.0	43.5 72.0
Heated at 700°F for 500 hrs. (4)	200,900	190,400	11.8	50.2	29.0	25.0	43.0 71.5
Heated at 700°F for 1000 hrs. (4)	198,000	188,300	12.7	51.5	28.9	26.0	43.0 71.5

(1)—0.2 pct set method.

(2)—From Izod impact specimens.

(3)—After aging at 950°F for 30 min.

(4)—After heat treatment to produce 210,000 psi tensile strength

Structural jet alloys (continued)

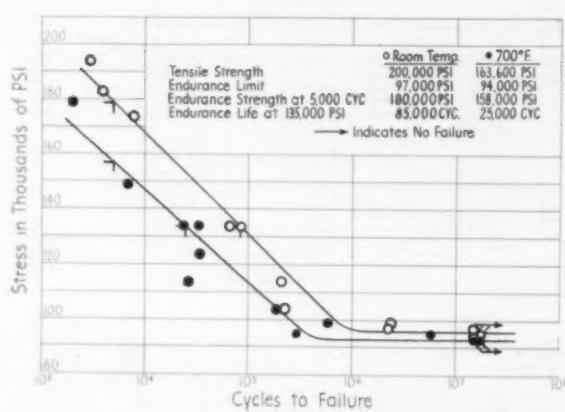


FIG. 8—S-N curves for Stainless W at room and 700°F temperatures.

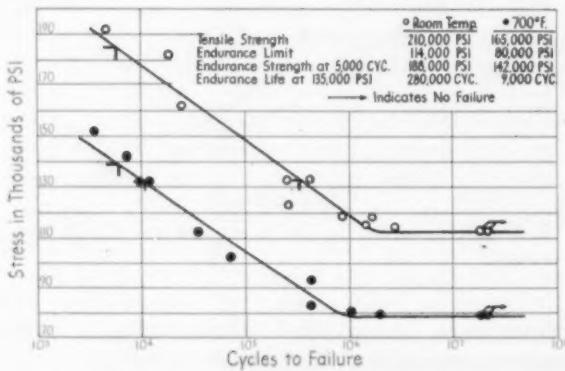


FIG. 9—S-N curves for 4340 at room and 700°F temperatures.

Figs. 7, 8 and 9.

The fatigue curves, for Inconel X, at room and elevated temperatures, resemble those for nonferrous alloys rather than ferrous alloys. Due to this behavior of Inconel X under reversed bending, it was necessary to substitute the endurance strength at 15 million cycles for the endurance limit for comparison purposes. The endurance limits for stainless W and SAE 4340 were determined by noting from the curves the unit stress corresponding to 15 million cycles of stress application without failure. For steels, a life of 10 million cycles affords a reasonable assurance that the endurance limit has been reached. The endurance limit is defined as the highest unit stress whose repeated application can be indefinitely endured without failure.

The reversed bending endurance limit for Inconel X at 900°F was found to be lower than the endurance limits for Stainless W and SAE 4340 at 700°F. However, the endurance strength at 5000 cycles and endurance life at 135,000 psi for Inconel X at 900°F were higher than those for SAE 4340 at 700°F and lower than those for Stainless W at 700°F.

The following conclusions regarding the effects of the exposure on the alloys' room temperature

TABLE III

STRESS-RUPTURE DATA

Material	Temper- ature (°F)	Stress (psi)	Rupture Time (hours)	Elong. (2 in.) (per cent)	Reduction of Area (per cent)
Inconel X	77	178,340*	....	22.8	38.2
	900	167,000*	0.001	12.0	40.0
	"	166,000	0.012	18.4	40.0
	"	164,000	0.05	11.8	40.0
	"	163,000	21.0	17.7	20.0
	"	156,000	25.2	15.7	24.0
	"	150,000	42.5	....	....
	"	145,000	78.7	10.8	18.0
	"	140,000	449.7	4.4	7.0
	77	198,800*	....	12.0	52.4
Stainless W	77	198,800*	0.001	8.4	52.0
	700	163,600*	0.03	5.5	50.0
	"	160,000	0.24	6.3	50.0
	"	158,000	0.50	11.7	56.0
	"	154,000	3.8	11.3	54.0
	"	148,000	61.8	13.2	52.8
	"	140,000	723.9	26.4	52.0
	"	135,000	971.2	11.7	44.0
	77	210,830*	....	12.3	53.0
	700	185,800*	0.0012	10.2	53.0
SAE-4340	77	158,000	0.09	12.8	62.0
	"	155,000	0.18	10.8	54.0
	"	150,000	2.9	11.8	57.4
	"	138,000	98.0	17.8	55.9
	"	124,000	190.0	11.8	24.8

*—Short-time tensile strength.

TABLE IV

CREEP PROPERTIES

Material	Temperature (°F)	Stress to Produce Minimum Creep Rate Indicated (psi)		
		0.01 pct per 1000 hr	0.1 pct per 1000 hr	1.0 pct per 1000 hr
Inconel X	900	72,000	95,000	128,000
Stainless W	700	80,000	80,000	124,000
SAE-4340	700	8,100	32,000	121,000

TABLE V

CREEP DATA FOR INCONEL X, STAINLESS W AND SAE-4340

Material	Temper- ature (°F)	*Minimum Creep Rate (Pct per 1000 hr)			Strain Upon Application (In. per in.)	Total Plastic Strain (In. per in.)
		Strain (Pct per 1000 hr)	Test Load (In. per in.)	Creep Rate (Pct per 1000 hr)		
Inconel X	900	135,000	1.410	0.01638	0.0158	
	"	119,000	0.977	0.00838	0.0105	
	"	100,000	0.184	0.00366	0.0025	
	"	100,000	0.140	0.00304	0.0018	
	"	73,000	0.069	0.00240	0.0012	
Stainless W	700	135,000	0.500	0.00556	0.0738	
	"	125,000	1.000	0.00518	0.0127	
	"	100,000	0.190	0.00396	0.00378	
	"	80,000	0.120	0.00338	0.00198	
	"	65,000	0.067	0.00276	0.00124	
SAE-4340	700	114,000	0.250	0.00481	0.0678	
	"	110,000	3.810	0.00417	0.0483	
	"	85,600	0.342	0.00373	0.00843	
	"	55,000	0.251	0.00312	0.00594	
	"	45,000	0.191	0.00256	0.00400	
	"	40,000	0.158	0.00190	0.00345	
	"	35,000	0.108	0.00161	0.00260	
	"	25,000	0.067	0.00102	0.00103	

*—Equivalent to the straight-line portion of the creep curve or secondary creep rate.

Heat Treatment

Inconel X—blanks cut and specimens machined. No heat treatment was required. However, the process employed to furnish this alloy for the investigation was: Hot roll—age 1300°F for 20 hr.

Stainless W—blanks cut and specimens machined. Specimens were then aged at 950°F for 30 min.

SAE 4340—blanks cut, heat treated to 210,000 psi (oil quench from 1500°F, temper at 810°F) and machined into specimens.

tensile and impact properties can be safely drawn: (1) There was little or no change in the properties of Inconel X; (2) the tensile and yield strengths, and hardness of Stainless W were increased progressively while the impact strength and ductility were decreased; (3) the tensile and yield strength of SAE 4340 decreased progressively with little change in the impact strength and ductility.

Further, the Charpy impact values of aged Stainless W at 700°F showed a pronounced increase over the values obtained for the same condition at room temperature. The decreasing order of merit for the alloys, with respect to resistance to rupture and creep, is Inconel X at 900°F, Stainless W at 700°F, and SAE 4340 at 700°F. Inconel X alloy is expected to be in an even more favorable position with respect to resistance to rupture and creep at 700°F.

At 700°F the Stainless W has a greater resistance to reversed bending fatigue than SAE 4340 steel. Since the reversed bending fatigue tests of Inconel X alloy were conducted at 900°F, it is difficult to draw valid conclusions relating the endurance properties of Inconel X to the corresponding properties of the other two.

The sequence of operations in machining the test specimens and heat treating to produce tensile strength of 200,000 to 220,000 psi, before testing is shown in the box.

The tensile testing of specimens at room temperature and elevated temperatures was conducted in a Baldwin-Southwark tensile testing machine. The specimens were controlled at 700°F and 900°F to within $\pm 3^\circ\text{F}$. The temperature uniformity along the gage length of the specimen was kept to within 1.5°F by adjusting the furnace winding resistors.

Stress-rupture testing of the specimens at 700°F and 900°F was conducted in the Olsen type rupture machines and the Baldwin type creep-rupture machines. The temperature of the specimens was controlled to within $\pm 3^\circ\text{F}$ and the temperature uniformity along the gage length of the specimens was kept within 1.5°F . Periodic extension measurements of the speci-

mens during these tests were made by a dialgage type extensometer.

The reversed bending fatigue tests, at room and elevated temperature, were conducted in a modified constant deflection type Krouse plate flexure fatigue machine. In this machine a range of bending stresses can be produced in the test section of the specimen by merely adjusting the length of the vise bar and the variable throw crank (1750 rpm-rotating speed) on the fatigue machine.

A laboratory muffle-type furnace was adapted for making the elevated temperature fatigue tests. The furnace temperature was controlled to

TABLE VI
TENSILE STRENGTH AND REVERSED BENDING FATIGUE PROPERTIES

Property	Inconel X Alloy Room Temper- ature	Inconel X Alloy 900°F	Stainless W Alloy Room Temper- ature	Stainless W Alloy 700°F	SAE-4340 Steel Room Temper- ature	SAE-4340 Steel 700°F
Tensile Strength, psi	178,300	167,000	188,000	163,000	210,000	165,000
Endurance Limit, psi	82,000	73,000*	97,000	94,000	114,000	80,000
Endurance Strength at 5,000 cycles, psi	174,000	146,000	180,000	156,000	188,000	142,000
Endurance Life at 135,000 psi, cycles	60,000	11,500	85,000	25,000	280,000	9,000

*—Endurance strength at 15,000,000 cycles.

TABLE VII
REDUCTION IN TENSILE AND REVERSED BENDING FATIGUE PROPERTIES AT ELEVATED TEMPERATURES

Property	Alloy and Testing Temperature,		
	Inconel X 900°F	Stainless W 700°F	SAE-4340 700°F
Tensile Strength, psi	8.3	17.8	27.1
Endurance Limit, psi	11.0	3.1	29.8
Endurance Strength at 5,000 cycles, psi	16.0	12.2	24.5
Endurance Life at 135,000 psi, cycles	81.0	70.6	96.8

within $\pm 7^\circ\text{F}$, by the portable, electronic, controlling recording potentiometer. Since the repeated bending fatigue specimen has a minimum diameter test section, it was only necessary to position this section in the central zone of the furnace, which was the zone of highest temperature.

The author wishes to thank E. L. Olcott and F. S. Williams for the many excellent suggestions they made throughout the course of the investigation. In addition, I thank J. J. Fox, P. J. Muscarnero and J. Vigliano for their careful and accurate assistance in conducting the tests and also J. Ballingall for the photomicrographs.

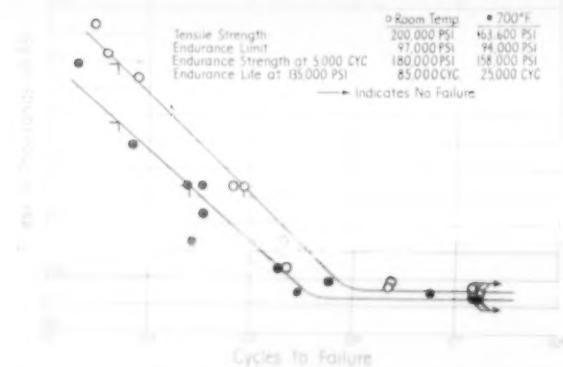


FIG. 8—S-N curves for Stainless W at room and 700°F temperatures.

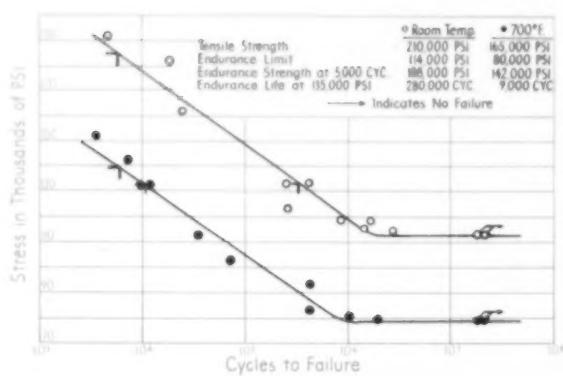


FIG. 9—S-N curves for 4340 at room and 700°F temperatures.

Figs. 7, 8 and 9.

The fatigue curves, for Inconel X, at room and elevated temperatures, resemble those for nonferrous alloys rather than ferrous alloys. Due to this behavior of Inconel X under reversed bending, it was necessary to substitute the endurance strength at 15 million cycles for the endurance limit for comparison purposes. The endurance limits for stainless W and SAE 4340 were determined by noting from the curves the unit stress corresponding to 15 million cycles of stress application without failure. For steels, a life of 10 million cycles affords a reasonable assurance that the endurance limit has been reached. The endurance limit is defined as the highest unit stress whose repeated application can be indefinitely endured without failure.

The reversed bending endurance limit for Inconel X at 900°F was found to be lower than the endurance limits for Stainless W and SAE 4340 at 700°F. However, the endurance strength at 5000 cycles and endurance life at 135,000 psi for Inconel X at 900°F were higher than those for SAE 4340 at 700°F and lower than those for Stainless W at 700°F.

The following conclusions regarding the effects of the exposure on the alloys' room temperature

STRESS-RUPTURE DATA

Material	Temperature (°F)	Stress (psi)	Rupture Time (hours)	Elong. (2 in.) (pct)	Reduction of Area (pct)
Inconel X	77	178,340*	....	22.8	39.2
	900	167,000*	0.001	12.0	40.0
	"	166,000	0.012	16.4	40.0
	"	164,000	0.05	11.8	40.0
	"	163,000	21.0	17.7	27.0
	"	158,000	25.2	15.7	24.0
	"	150,000	42.5	—	—
	"	145,000	78.7	10.8	18.0
Stainless W	77	190,000*	....	12.0	52.4
	700	163,800*	0.001	8.4	52.0
	"	160,000	0.03	5.5	50.0
	"	158,000	0.24	8.3	50.0
	"	155,000	0.50	11.7	50.0
	"	154,000	3.8	11.3	54.0
	"	148,000	61.8	13.2	52.8
	"	140,000	773.9	26.4	52.0
SAE-4340	77	210,830*	....	12.3	53.0
	700	165,800*	0.0012	10.2	53.0
	"	156,000	0.09	12.8	52.0
	"	155,000	0.18	10.8	54.0
	"	150,000	2.9	11.8	57.4
	"	135,000	98.0	17.0	55.0
	"	124,000	190.0	11.8	24.8

*—Short-time tensile strength.

TABLE IV

CREEP PROPERTIES

Material	Temperature (°F)	Stress to Produce Minimum Creep Rate Indicated (psi)		
		0.01 pct per 1000 hr	0.1 pct per 1000 hr	1.0 pct per 1000 hr
Inconel X	900	72,000	85,000	128,000
Stainless W	700	50,000	80,000	124,000
SAE-4340	700	8,100	32,000	121,000

TABLE V

CREEP DATA FOR INCONEL X, STAINLESS W AND SAE-4340

Material	Temperature (°F)	Strain Upon Application of Test Load			
		Stress (psi)	*Minimum Creep Rate (Pct per 1000 hr)	Total Strain (In. per in.)	Total Creep (In. per in.)
Inconel X	900	135,000	1.410	0.01838	0.0158
	"	119,000	0.977	0.00838	0.0105
	"	100,000	0.184	0.00386	0.0025
	"	100,000	0.140	0.00304	0.0018
	"	73,000	0.089	0.00240	0.0012
Stainless W	700	135,000	6.500	0.00556	0.0738
	"	125,000	1.000	0.00518	0.0127
	"	100,000	0.190	0.00398	0.00378
	"	80,000	0.120	0.00338	0.00199
	"	65,000	0.067	0.00278	0.00124
SAE-4340	700	114,000	5.250	0.00481	0.0678
	"	110,800	3.810	0.00417	0.0493
	"	85,000	0.342	0.00373	0.00843
	"	55,000	0.251	0.00312	0.00594
	"	45,000	0.191	0.00255	0.00400
	"	40,000	0.158	0.00190	0.00345
	"	35,000	0.106	0.00161	0.00260
	"	25,000	0.067	0.00102	0.00183

*—Equivalent to the straight-line portion of the creep curve or secondary creep rate.

Inconel X—blanks cut and specimens machined. No heat treatment was required. However, the process employed to furnish this alloy for the investigation was: Hot roll—age 1300°F for 20 hr.

Stainless W—blanks cut and specimens machined. Specimens were then aged at 950°F for 30 min.

SAE 4340—blanks cut, heat treated to 210,000 psi (oil quench from 1500°F, temper at 810°F) and machined into specimens.

tensile and impact properties can be safely drawn: (1) There was little or no change in the properties of Inconel X; (2) the tensile and yield strengths, and hardness of Stainless W were increased progressively while the impact strength and ductility were decreased; (3) the tensile and yield strength of SAE 4340 decreased progressively with little change in the impact strength and ductility.

Further, the Charpy impact values of aged Stainless W at 700°F showed a pronounced increase over the values obtained for the same condition at room temperature. The decreasing order of merit for the alloys, with respect to resistance to rupture and creep, is Inconel X at 900°F, Stainless W at 700°F, and SAE 4340 at 700°F. Inconel X alloy is expected to be in an even more favorable position with respect to resistance to rupture and creep at 700°F.

At 700°F the Stainless W has a greater resistance to reversed bending fatigue than SAE 4340 steel. Since the reversed bending fatigue tests of Inconel X alloy were conducted at 900°F, it is difficult to draw valid conclusions relating the endurance properties of Inconel X to the corresponding properties of the other two.

The sequence of operations in machining the test specimens and heat treating to produce tensile strength of 200,000 to 220,000 psi, before testing is shown in the box.

The tensile testing of specimens at room temperature and elevated temperatures was conducted in a Baldwin-Southwark tensile testing machine. The specimens were controlled at 700°F and 900°F to within $\pm 3^\circ\text{F}$. The temperature uniformity along the gage length of the specimen was kept to within 1.5°F by adjusting the furnace winding resistors.

Stress-rupture testing of the specimens at 700°F and 900°F was conducted in the Olsen type rupture machines and the Baldwin type creep-rupture machines. The temperature of the specimens was controlled to within $\pm 3^\circ\text{F}$ and the temperature uniformity along the gage length of the specimens was kept within 1.5°F . Periodic extension measurements of the speci-

and elevated temperature, were conducted in a modified constant deflection type Krouse plate flexure fatigue machine. In this machine a range of bending stresses can be produced in the test section of the specimen by merely adjusting the length of the vise bar and the variable throw crank (1750 rpm-rotating speed) on the fatigue machine.

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TABLE VI
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Property	Inconel X Alloy		Stainless W Alloy		SAE-4340 Steel	
	Room Temperature	900°F	Room Temperature	700°F	Room Temperature	700°F
Tensile Strength, psi	178,300	167,000	198,900	183,800	210,800	185,800
Endurance Limit, psi	82,000	73,000*	97,000	94,000	114,000	80,000
Endurance Strength at 5,000 cycles, psi	174,000	146,000	180,000	158,000	188,000	142,000
Endurance Life at 135,000 psi, cycles	60,000	11,500	55,000	25,000	200,000	8,000

* Endurance strength at 15,000,000 cycles.

TABLE VII
REDUCTION IN TENSILE AND REVERSED BENDING FATIGUE PROPERTIES AT ELEVATED TEMPERATURES

Property	Alloy and Testing Temperature, Reduction, pct		
	Inconel X 900°F	Stainless W 700°F	SAE-4340 700°F
Tensile Strength, psi	6.3	17.8	27.1
Endurance Limit, psi	11.0	3.1	29.8
Endurance Strength at 5,000 cycles, psi	16.0	12.2	24.5
Endurance Life at 135,000 psi, cycles	81.0	70.6	96.8

within $\pm 7^\circ\text{F}$, by the portable, electronic, controlling recording potentiometer. Since the repeated bending fatigue specimen has a minimum diameter test section, it was only necessary to position this section in the central zone of the furnace, which was the zone of highest temperature.

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SEALING OF ANODIZED ALUMINUM INCREASES

corrosion

resistance



By A. E. Durkin

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One important operation which is often overlooked in the anodizing of aluminum is "sealing." Sealing, which is the final step in the anodic process, is that operation which closes the pores of the anodic coating to make it non-adsorptive and stainproof. It alters the anodic coating to a monohydrate $\text{Al}_2\text{O}_3 \cdot \text{H}_2\text{O}$ and increases its life and weathering resistance. Much of the life of an anodic coating can be attributed to this operation and considerable control and attention should be focused on it.

Two important aspects of sealing which have been found to increase the life of anodized parts are the types and the pH of the water used in this operation. If tap water containing between 50 to 100 ppm of dissolved solids is used in sealing, it is evident that these impurities can be sealed into the anodic coating. They could, therefore, adversely affect the corrosion resistance of the coating. Also, if all or even part of the dissolved solids are organic in nature, they can be burned out of the coating in time if the anodized part operates at temperatures of between 100° and 200°C. These burned out spots

would be points of weakness in the coating and would be the points of first failure on corrosion tests.

A varying pH in the seal water tends for nonuniformity in the end product since some coatings would be thicker than others. Coatings of different thicknesses would, therefore, have different corrosion resistances. Also, in normal sealing operations, it has been observed that aluminum and copper impurities precipitate on the work being processed, as the pH of the sealing water goes below 5.2. If the pH can be controlled above that point, prolonged sealing tank life can be expected in addition to the increased corrosion resistance on the part being processed.

Two water types considered

In order to determine the effect of water and pH on the properties of a water sealed anodic part, two types of water were considered; demineralized or deionized and tap water. In order to determine the effect of pH on the sealing water, anodized parts were sealed in both waters

Anodized aluminum sealed in high purity water with a pH controlled at or near 6 has approximately 35 pct more corrosion resistance than when it is sealed in ordinary tap water where no pH control is exercised.

at pH values of between 3.3 and 10.7. The corrosion resistance of the anodized parts was determined in the standard salt spray test. The aluminum used in this test was 24ST and 2S. High copper silicon alloys could have been used but would have been too difficult to anodize and seal in short cycles as the panels would corrode too quickly for comparative test purposes.

The aluminum panels used throughout the following tests were processed in the Alumilite Process.¹ It should be noted, however, that similar results have been observed on chromic acid anodized parts.

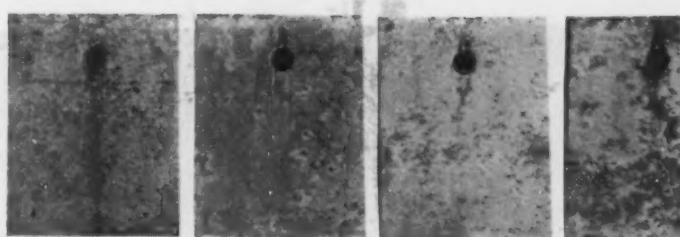
Sample 24ST aluminum panels were anodized and placed on salt spray for corrosion tests after being sealed in either tap or demineralized water at the pH values as indicated below. pH variations, where necessary, were made by the addition of either hydrochloric acid or caustic soda. The pH range in this test varied between 3.3 and 10.7 as indicated. After an 1800 hr 20 pct salt spray test conducted at 95°F, the panels were corroded to varying degrees depending upon the pH and the type of water used in the sealing bath.

Tap water is more corrosive

Representative panels for each set of sealing conditions are shown in Fig. 1. This photograph shows that the panels sealed in demineralized water are more corrosion resistant than those sealed in tap water at comparable pH values. While sealing in the former type water imports more corrosion resistance to the test specimens at all the pH values tested, its superiority is more evident at pH values near 6. Apparently, the reduced dissolved solids content of demineralized water is responsible for the improved corrosion resistance of the panels.

It is evident that the panels sealed in the demineralized water at a pH of 6.4 are more corrosion resistant than those sealed in tap water at a pH of 6.8.

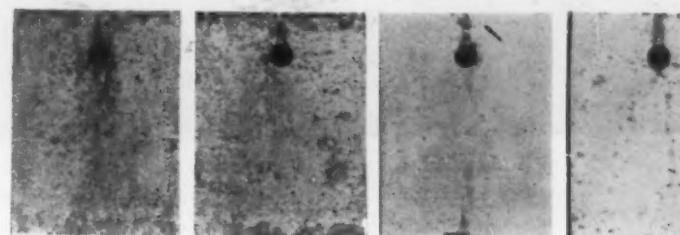
The superior corrosion resistance of panels sealed in tap water controlled at a pH of 5.8 is indicated in Fig. 2. The upper panels which were sealed in tap water at a pH of 6.8 are



Sealed in tap water: pH values (l. to r.) 3.3, 5.8, 6.8, 10.7

FIG. 1—Samples of 24ST Al after 1800 hr in salt spray.

Sealed in demineralized water: pH values 3.7, 4.8, 6.4, 8.2



considerably more pitted than those sealed at the lower pH values. While the latter panels do show staining, there is little evidence of pitting.

These results indicate that, while demineralized water is a better sealing medium than tap water, tap water can be used effectively where high purity water is not available if its pH is controlled as close to 6 as possible.

Sample 2S aluminum panels were prepared and tested by the same procedure used on the 24ST panels considered above. Although the corrosion rate of this stock is very slow, the differences in corrosion after a 1270-hr salt spray test confirm the observations made in the case of the 24ST aluminum. This is evident in Fig. 3, which again shows that demineralized water sealing is definitely superior to tap water sealing. The corrosion differences, due to the sealing pH, are not as clearly defined on the 2S panels as they are on the 24ST panels. Yet, it appears that the optimum sealing pH will be approximately 6 for the 2S panels.

Control of pH is more critical in tap water sealing than it is in demineralized water sealing because the corrosion resistance of parts is

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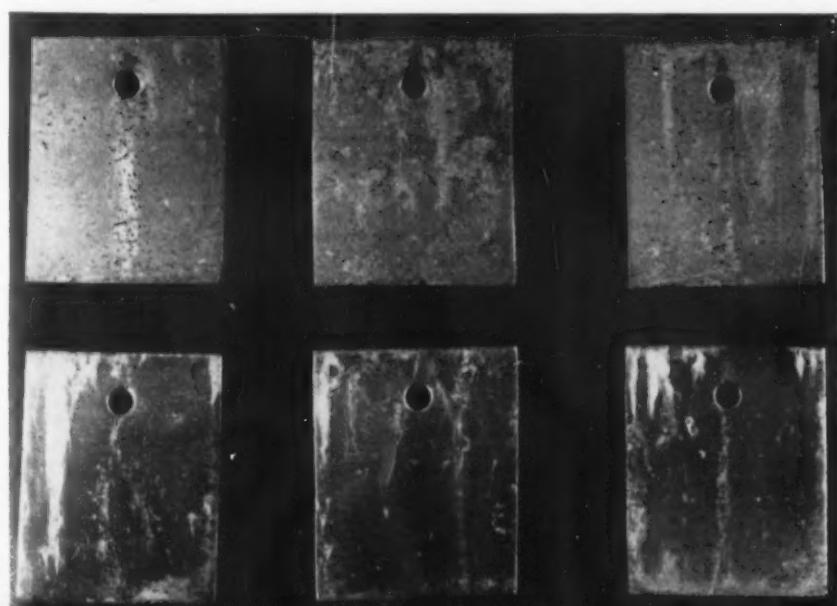


FIG. 2—Superior corrosion resistance of 24ST cast Al panels sealed in tap water at a pH of 5.8. Above: sealed in tap water pH 6.8. Below: sealed in tap water pH 5.8.



FIG. 3—Anodized 2S Al after 1270 hr in salt spray. Left: sealed in demineralized water pH = 5.8. Right: sealed in tap water pH = 5.9.



FIG. 4—Anodized 2S Al after 1270 hr in salt spray. These panels were sealed in demineralized water at a pH of 5.8. Left: not heated. Right: heated 50 hr at 105°C.

Sealing anodized aluminum (continued)

affected to a marked degree by the dissolved solids in the bath as well as by the pH. Sealing at other than the optimum pH would add to the harmful effect produced by the dissolved solids, and the resulting corrosion resistance would be considerably lessened. Since demineralized water has a low concentration of dissolved solids, the harmful effect of these contaminants is less pronounced and the sealing pH becomes less critical.

Regardless of the sealing pH, it is an established fact that the corrosion resistance of any sealed anodic coating can be destroyed by subjecting it to heat. When heated to temperatures of between 100° and 200°C, anodic coatings craze or crack and untreated aluminum is exposed to corrosive attack. The resistance to heat crazing depends primarily upon the anodizing conditions. A coating processed under proper conditions will withstand temperatures slightly over 200°C without crazing. Organic matter will burn out of a coating in time at temperatures under the crazing temperature. If parts are being sealed in water containing 50 to 60 ppm of organic matter, their overall corrosion resistance should be affected.

Crazing Promotes Attack

The effect of crazing on the corrosion resistance of anodized 2S aluminum panels is shown in Fig. 4. It can be noted here, that the uncrazed specimen is relatively uncorroded, while the crazed specimen shows considerable corrosion. Also, the uncrazed areas of the right-hand crazed panel are relatively unaffected by the test. The differences in corrosion shown here would be much more pronounced on less pure aluminum such as 24ST, because of its greater susceptibility to corrosive attack.

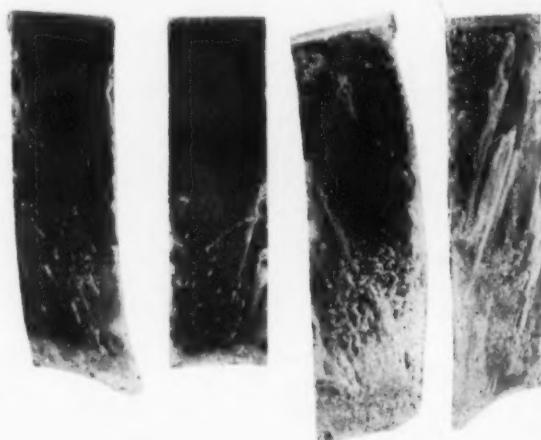
The effect of the impurities in anodic coatings

caused by tap water sealing on parts which operate hot is shown in Fig. 5. The two at left were treated in the conventional fashion. The right panels were treated the same way but were heated 48 hr at 135°C after sealing but before testing for corrosion resistance. These samples were processed from the same stock and were anodized and sealed at the same time. The superiority of the left panels is evident. Admittedly, there is an edge effect and some indication of crazing. The local corrosion, however, of the right hand panels is more marked than the corrosion in the left panels. The above comparison was made between sections of 2S aluminum cut from a production part.

Reference

- (1) Sulphuric Acid Anodizing Process of the Aluminum Co. of America.

FIG. 5—Relative corrosion resistance of sealed anodized 2S Al. All samples sealed in tap water pH 7 and salt spray tested for 1270 hr. The two panels at the right were heated 48 hr at 135°C.



DUCTILE IRON

replaces alloy gear castings, forgings



By J. D. Sheley

Metallurgist Black-Clawson Co.
Hamilton, Ohio

Ductile iron is proving an excellent substitute for alloy steel castings and forgings in paper machinery gears and other components. Heat treating gives tensile strengths up to 216,000 psi, hardness over 400 Bhn. Critical materials are saved, and production schedules maintained, by this substitution.

Conservation of critical materials is being accomplished by the Black-Clawson Co., Hamilton, Ohio, through substitution of ductile cast iron for alloy steel and Ni-Hard castings, and alloy steel forgings. Properly heat treated, ductile iron is proving a very successful replacement in components, mostly gears, in this company's line of papermaking and allied equipment. Black-Clawson is also successfully welding ductile iron to steel, to stainless steel, and to itself.

Table I gives the physical properties of several different heat-treated ductile iron test bars. These tests were made when Black-Clawson was establishing the practicability of

using heat treated ductile iron as a substitute material. The heat treatment consisted of heating the specimens in an electric furnace to 1550°F, holding at that temperature for 1 hr, then immediately oil quenching. Following the quench, specimens were drawn in an electric furnace at the temperatures indicated in Table I, and held at drawing temperature for 1½ hr. Figs. 1 and 2 show photomicrographs of two of these specimens.

Fig. 3 shows a photomicrograph of a ductile iron weld. Deposited weld metal is at the top, and very fine pearlite at the bottom. There was no martensite structure observed.

Fig. 4 shows a large spur gear for a calender

TABLE I
HEAT TREATED DUCTILE IRON PROPERTIES

	Original Properties				Heat Treat Properties				
	Tensile strength, psi	Yield strength, psi	Elong., per cent	Hardness, Bhn	Draw temp., °F	Tensile strength, psi	Yield strength, psi	Elong., per cent	Hardness, Bhn
Test 1 Sample 1	116,500	96,000	5	262	800	185,000	150,000	1	430
	2	97,000	69,000	10	228	800	218,000	167,000	1	418
Test 2 Sample 1	106,500	82,000	4½	286	900	196,000	121,000	2½	402
	2	100,500	82,500	8	223	900	153,500	131,000	1½	302
Test 3 Sample 1	96,500	73,000	7	228	1000	181,000	147,500	1¼	381

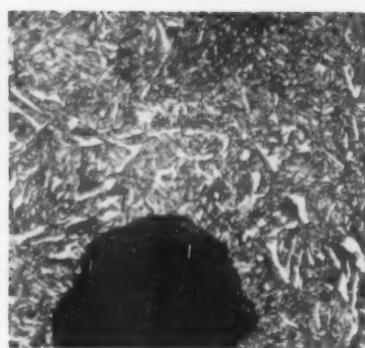
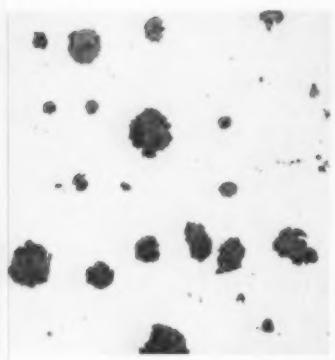


FIG. 1—Photomicrographs of Sample 3, Test 1, in the accompanying table. Left, 100X, no etchant. Right, 500X, etchant 2 pct Nital.

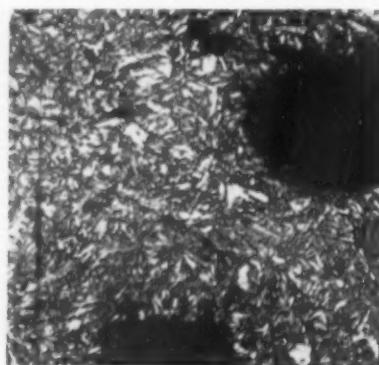
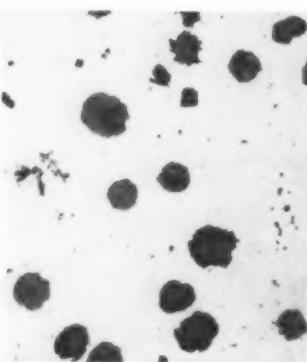
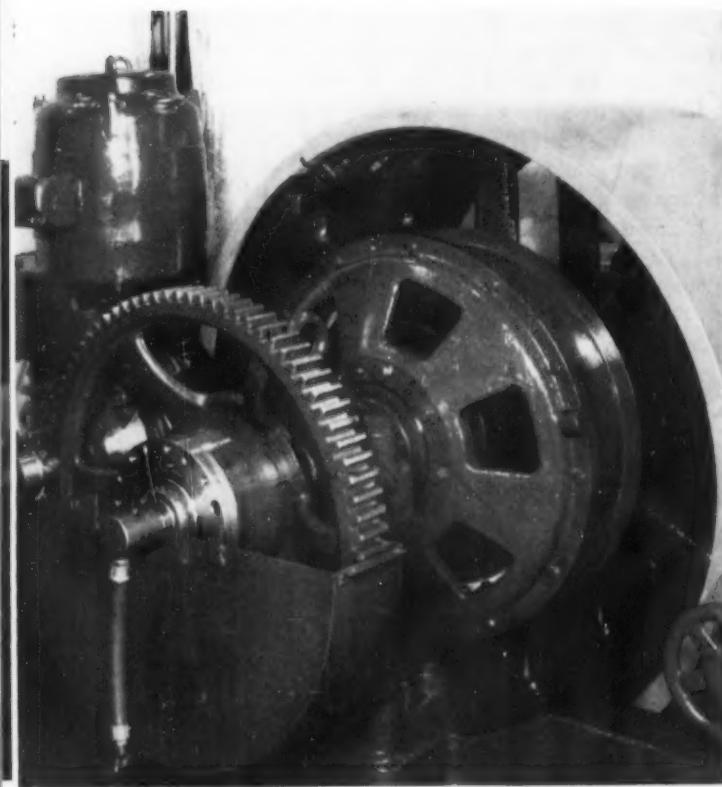


FIG. 2—Photomicrographs of Sample 1, Test 3, in accompanying table. Left, 100X, no etchant. Right, 500X, etchant 2 pct Nital.

FIG. 4—A typical gear of the type Black-Clawson is casting in ductile iron.



Ductile iron replaces alloy (continued)

TABLE II

ANALYSIS OF SAMPLES

	Si, pct	Mn, pct	K, pct	S, pct	Mg, pct	Ni, pct
Test 1 Sample 1	2.20	0.31	0.030	0.015	0.063	1.57
	2.50	0.44	0.033	0.018	0.040	0.94
Test 2 Sample 1	2.21	0.33	0.051	0.015	0.049	1.58
	2.36	0.27	0.033	0.010	0.068	1.48
Test 3 Sample 1	2.39	0.30	0.046	0.016	0.047	1.12



FIG. 3—Photomicrograph of ductile iron weld area. Deposited weld metal is at top, very fine perlite at bottom. 500X. Etchant 2 pct Nital.

drive, now cast in ductile iron instead of carbon steel. It is annealed at 1400°F for 2½ hr before machining. No flame hardening is done on this gear. A large spiral bevel gear was formerly made from a 4140 alloy steel forging, the teeth being flame hardened after cutting. Now the blanks for this gear are cast in ductile iron. They are annealed for 1½ hr at 1650° to 1675°F, slow cooled to 1275° to 1290°F, and held at this temperature for 4½ hr. After this treatment, the machining is done, then the teeth are flame hardened as before.

At the present time, Black-Clawson is pouring ductile iron castings from less than 1 lb to more than 7½ tons in weight. Spiral bevel gears range in weight from 200 to 400 lb, and gears in general range from 15 to 1500 lb. Ductile iron has been working very satisfactorily in these parts. Its wear resistance, in particular, is excellent.

Ductile cast iron is produced by Black-Clawson foundries in five basic grades. Depending on heat treatment, these give a range of tensile strength from 65,000 to over 100,000 psi, and hardness from 170 to over 450 Bhn. The material is also being used, in some cases, in place of gray iron and malleable iron.

news of industry

CMP Given Its Basic Structure for Operation

Regulation 1 steers manufacturers into the CMP orbit . . . It tells how to get allotments, how production will be balanced to supply . . . Regulation 3 sets priority status for materials.

Washington—Heavy machinery to operate CMP was installed by National Production Authority last week. Regulations 1 and 3 were issued to build the basic structure around which the plan will function. (*THE IRON AGE*, Apr. 19, 26, 1951, pp. 101, 109.)

Regulation 1 tells manufacturers how to enter the CMP orbit, what information to submit to get CMP allotments. It explains how defense and defense-supporting production schedules will be established and how CMP will channel steel, aluminum, and copper to them. One objective is to see that demands do not exceed supply.

Preference Status — Regulation 3 sets forth the preference or priority status of essential materials and goods to be delivered for rearmament or the economy. To be issued shortly are Regulation 2, covering inventories, and Regulation 4, covering distributors.

Since the original CMP order had included "A" and "B" categories of products, NPA followed through with a booklet containing 4000 manufactured "B" products. They are the principal concern of Regulation 1. Industry must specify its requirements on standard reporting and application forms.

Under Regulation 1 makers of military "A" products will get allotments through a government agency. "A" product makers will get DO's for "B" list products needed to complete their end product. "B" producers will get almost all their allocation from NPA's industry divisions. These producers include machine tools,

bearings, agricultural equipment, and other general purpose products.

To Decide Allotments — The Requirements Committee of the Defense Production Administration will decide on the amounts of controlled materials claimant agencies (government) and NPA industry divisions will have at their disposal for their production schedules.

Delivery time for CMP allocation orders are provided. Numbers will be carried by CMP allotment of materials for a product. These numbers are to go on a manufacturer's order forms. The regulation lists how many days in advance specific orders must be placed for later delivery.

Approved "A" and "B" production schedules will have a DO rating thrown in for other needed materials. This DO may be applied and extended to products other than CMP metals. Regulation 3 specifies that an authorized controlled order has delivery priority over any other delivery order for controlled material, no matter when placed. It does not have top billing over an NPA directive, though.

Manufacturers with orders for controlled materials delivery after June 30, placed before receiving official output schedules and allotments, are shown in Regulation 1 how to convert the original order into authorized form. Regulation 3 lists the method for converting outstanding orders for other than controlled materials into the DO form with the related allotment number.

How CMP Works

Washington — Businessmen who saw the fine print in Controlled Materials Plan regulations and blanched will have some of the confusion cleared at explanatory meetings to be held by NPA.

A series of regional meetings will be held from May 15 to 22 in principal industrial centers across the country. Sponsors will be Dept. of Commerce field offices and local groups.

Meetings will be held at: Detroit, Seattle, Portland, San Francisco, Los Angeles, Chicago, Minneapolis, Denver, Kansas City, St. Louis, Philadelphia, Boston, New York, Cleveland, Pittsburgh, Houston, Dallas, New Orleans, Atlanta, and Richmond.

States Urged to Find Scrap; NPA Drive Aims at More Tonnage

Washington — NPA's scrap drive was touched off last week by letters sent to the governors of all states by Administrator Manly Fleischmann.

He asked that they instruct various departments to clean out discarded and obsolete equipment, search out other sources of dormant scrap.

Lost: 2.3 Million Production Days

Washington — Strike idleness in March involved 140,000 workers and resulted in 2.3 million days of lost production, the Labor Dept. reports. Both figures were under those for March, 1950. Biggest single work stoppage in March, 1951, involved 11,000 workers for Jones & Laughlin Steel Corp. and a subsidiary railroad at Pittsburgh.

— INDUSTRIAL SHORTS —

Increases Facilities — CLEVELAND METAL ABRASIVE CO., Cleveland, is completing the construction of a concrete block and steel addition to its plant there. This addition is designed to increase the production of 20th century normalized and cut wire shot approximately 50 pct.

Sales and Service — Another new sales and service office, their sixth completed thus far in their present plan of expansion, has just recently been completed by FAIRBANKS, MORSE & CO., and is located at 3000 W. 117 St., Chicago.

Expansion — HARBISON-WALKER REFRactories CO. will build a \$3.5 million silica plant near Downingtown, Pa. This is in addition to a \$22 million expansion program previously announced.

Casting Plant — Fabricast Div. of GENERAL MOTORS CORP. will produce permanent mold aluminum castings at a new plant to be built at Jones Mills, Ark.

Rod Mill Furnace — United Engineering & Foundry Co. has awarded a contract to the Salem Engineering Div. of SALEM-BROSUS, INC., for a pusher type billet reheating furnace for the new rod mill the Jones & Laughlin Steel Corp. is building at its Aliquippa works.

Track For Naval Depot — L. B. FOSTER CO., suppliers of railroad trackage, steel sheet, piling and pipe, received the contract to furnish 44 miles of 85 lb rail for installation at the U. S. Naval Ammunition Depot at Camden, Ark.

Sprague Acquisition — The SPRAGUE ELECTRIC CO. has purchased part of the main plant of the former Holden-Leonard woolen mill in Bennington, Vt., to expand its facilities for the manufacture of high-temperature magnet wire.

Diversified Expansion — Canadian operations of Hayes Mfg. Corp. and its subsidiaries have been expanded and diversified as a result of the acquisition, for an undisclosed cash consideration, of the business and assets of Bawden Machine Co., Ltd. The company has been renamed BAWDEN INDUSTRIES, LTD.

At Home — BARKSDALE VALVES, manufacturers of extreme pressure 'Shear-Seal' Valves, have recently moved to their own plant at 1566 E. Slavson Ave., Los Angeles.

Five Distributors — Appointment of five new distributors for their cast-alloy cutting tools has been made by CROBALT, INC. H. G. Bissell, 116 N. Mound St., Lebanon, Ohio, MacInnes Steel Sales Co., 502 Marine Bank Bldg., Erie, Pa., Eugene Roth, Inc., 250 W. 57th St., New York, H. J. Scheid & Co., 18 W. Chelten Ave., Philadelphia, and United Industries Co., 3131 Cherry Ave., Long Beach, Calif.

Pump Division Added — The BINKS MFG. CO., Chicago, makers of spray painting and finishing equipment, has added a Pump Div. which will deal primarily with material handling pumps.

Plant Plans — Plans are underway for a new \$2 million gear manufacturing plant to be located at Belmont, Calif., for WESTERN GEAR WORKS. Construction will begin in a few weeks. Completion of the plant is scheduled for late summer.

Navy Orders — DAYSTROM, INC., Elizabeth, N. J., has received an order from the Dept. of Defense to build U. S. Navy fire control equipment. The company will erect a new plant in Scranton, Pa., representing an investment of more than \$4 million to carry out the manufacturing, assembly and testing activities called for in the contract.

Scrap Salvage; New Methods Save Materials for Westinghouse

Mansfield, Ohio — Scrap conservation, product redesign and workers' suggestions are saving Westinghouse \$1½ million a year in hard-to-get metals.

Last year the Westinghouse salvage department saved 23,000 tons of steel and more than 815,000 lb of nonferrous metals. Rescued from a junk-yard journey, these materials were put back in production.

Salvage ingenuity made 80,000 paper carton pads per month from shipping cartons used by suppliers. Other savings include enough lumber to crate 3300 refrigerators and 160,000 gals of paint from spray booths.

Engineers are developing new material saving designs and methods. A copper sintered clutch plate on an automatic washer will save from 70 to 80 pct of copper used in present clutch plate.

Periodic reverse-current plating is expected to conserve critical nickel supplies.

Jones & Laughlin Lets Contract

Pittsburgh — Rust Engineering Co. has been awarded a contract to build new facilities for Jones & Laughlin Steel Corp. Included are a new 350 ft x 125 ft coil cooling and temper mill building, roll shop, annealing building extension, and a battery charging station. The contract also includes a cleaning building to be used in connection with tin plate expansion at Aliquippa.

New Refractory Plant at Warren

Philadelphia — General Refractories Co. will build a \$3 million silica refractories plant on a recently purchased 29-acre site near Warren, Ohio. Total spending in the firm's current expansion will now reach \$12 million, said Floyd L. Greene, president.

The plant will contain 200,000 sq ft and will produce silica refractories for the iron and steel industry. It will have scien-

tically controlled oil-burning tunnel kilns, each 600 ft long, to fire the refractories.

At a recent stockholders' meeting it was voted to increase the company's authorized indebtedness from \$9 million to \$15 mil-

lion. Net income for the first quarter of 1951 was \$693,487 as compared to \$676,623 for the comparable quarter last year. Federal and Pennsylvania taxes were double those of the first quarter of 1950.

Steel Warehouse Inventories Off 40 Pct

Walter S. Doxsey tells American Steel Warehouse Assn. of 40 pct drop since Sept. 1949 . . . Record 550 steelmen attend 42nd annual meeting of distributors in Chicago.

Chicago — Warehouse inventories have dropped to 40 pct of normal since September 1949. They have been greatly depleted since the Korean war and there is little chance now of rebuilding them for some time to come, said Walter S. Doxsey, president of the American Steel Warehouse Assn.



Walter S. Doxsey

His audience consisted of a record number of 550 steel executives, meeting here at the Drake Hotel for the 42nd annual meeting of their group. Mr. Doxsey's talk started off proceedings at the opening session.

These observations supported views expressed in a pre-convention press conference by five association directors from all sections of the country who outlined warehouse conditions in their areas.

Inventories in the South and Midwest are running about 40 pct of normal, in the East about one third, and on the West Coast from 20 to 30 pct. However, these figures include a high percentage of seldom used "cats and dogs."

Stocks of more popular sizes and grades in many cases are much lower. Alloy and stainless steels, not covered in the warehouse order M-6, are almost impossible to get without DO's.

Vital Source—The need for as-

suring warehouses of adequate inventories was brought out by the fact that over one half million small manufacturers depend on them for steel. If this source of supply were further curtailed, the country would face the danger of large-scale plant shutdowns and resulting economic distress.

Many large manufacturers also depend on warehouses to fill in odds and ends of their normal steel requirements and assist in relieving spot shortages which crop up.

Warehouses also contribute to high steel production by filling orders too small for mills to handle and maintain long efficient production runs.

Steel executives heard Tom Campbell, editor of THE IRON AGE, and Manly Fleischmann, NPA administrator, speak. Other major talks were delivered by Charles

R. Hook, chairman, Armco Steel Corp., and Robert W. Wolcott, chairman of the steel industry scrap drive.

At the final session, L. B. Worthington, president, U. S. Steel Supply Co., was reelected chairman of the executive committee while Walter S. Doxsey was reelected president and secretary. Other officers include: Ben H. Knipe, Markele Steel Co., Houston, and Donald C. Lott, Fort Duquesne Steel Co., Pittsburgh, vice-presidents; and Paul O. Grammer, Grammer, Dempsey & Hudson, Inc., Newark, treasurer.

Hydroelectric Project Gets OK

Washington—The Federal Power Commission has approved a 50-year license to Pacific Power & Light Co., of Portland, for construction and operation of a hydroelectric project on the Lewis River in the state of Washington.

Estimated cost of the two-dam, four-unit (70,000 hp turbines) project is about \$33.3 million. Because of pressing power shortages, the FPC has told the utility company to go ahead with construction at once but at its own risk.

Southern Natural Gas Co. has asked FPC approval of proposed plans to construct an additional 169 miles of pipelines in Alabama, Georgia, Mississippi, and Louisiana, with three compressor stations. Cost is estimated at \$13.6 million.

CANNED POWER: Strong, dry can protects jet engine for F-84 Thunderjet until ready for use. Here line crew prepares to remove tail section to expose engine. Canned engine can be dropped at sea, floated ashore in amphibious landing.





Save Labor—Save Time—Save Money

Industry lines up \$10 million worth of equipment . . . Over 25,000 attend, 240 firms display . . . Have outdoor section for first time . . . Conference has 61 papers—By Gene Beaudef.

Chicago—A lineup of about \$10 million worth of equipment and supplies to make materials handling smoother and more time-saving were put on the floor of the International Amphitheater here last week by 240 companies. It was the largest show in the history of the industry and record throngs of more than 25,000 engineers and executives crowded the aisles to see the latest models and features.

Equipment in Action—An innovation at the 8-acre exhibit was an outdoor section to show loading and bulk handling equipment in action. The week-long show was the fourth national Materials Handling Exposition sponsored by the Materials Handling Institute. Running concurrently from May 1 to 3 was the Materials Handling Conference, staged by the American Materials Handling Society. Sixty-one technical papers were presented.

Elmer F. Tyman, vice-president of Yale & Towne Mfg. Co., declared that industrial capacity could shoot up 10 pct without building of new facilities with fuller use of modern materials handling equipment and techniques. More than 1 million men could be released for essential in-

dustrial and war work, he said.

Yale & Towne's new industrial fork lift truck made its debut. It is powered by a Hercules 6-cylinder, 70-hp diesel engine and equipped with an automatic transmission. Called the "Diesel-Lift," it is particularly desirable where the use of gasoline engines are prohibited as a fire hazard.

New Sideloader—Another "first" displayed by Automatic Transportation Co. of Chicago, is a new sideloader attachment for fork trucks which makes complete fork truck operation possible in 6-ft wide aisles. Normal width of such aisles runs usually around 12 ft. Instead of the truck turning, the forks revolve through 90 degrees while the truck stays in fixed position, able to stack on either side while in a longitudinal position.

An automatic pallet loader for 36-in. wide pallets was introduced by the Lamson Corp., Syracuse, N. Y. Formerly 40 in. was the minimum width handled by the device which is designed to eliminate manual pallet loading in mass production operations such as those in the bottling industry.

Modern Dunnage Co., Philadelphia, displayed a unique type of packaging material for shipping

highly sensitive instruments—reclaimed foam rubber formed into a mold conforming to the shape of part or product. The mold containing the instrument fits snugly into a steel container.

Freight Car Shipping—Other crowd-stoppers were a demonstration of Pullman-Standard Car Mfg. Co.'s new compartmentizer for sealing off freight car space to prevent goods from shifting, and Whiting Corp.'s Trackmobile.

The Materials Handling Conference comprised individual sections sponsored by 17 chapters of the American Materials Handling Society. General conference chairman Allen K. Strong, American Cyanamid Co., said industry spent \$9 billion to move its products from crude material stage, manufacturing, to consumer outlets. He estimated at least \$2 billion could have been saved with better materials handling methods.

Discussions covered a wide range, including costs, unit loads, yard handling, bulk handling and shipping. Bulk handling and storage methods was discussed by a 5-man panel consisting of Robert B. Cannon, Manufactured Products Div., Borden Co.; James B. McGinn, America Viscose Corp.; R. G. Pennington, Esso Standard Oil Co.; Frank G. Watson, Shell Chemical Corp., and R. F. Weber, International Harvester Co.

When to Use—In determining whether to use drums, tank cars or pipe lines in transporting bulk materials, Mr. Pennington said the following factors should be con-

sidered: movement continuing the type of graphical consuming transportation

Other factors e handling reduction ers, labor methods working c

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sidered: size and regularity of movement, long range outlook for continuing the present method, the type of product involved, geographical location of supplies, and consuming areas, and comparative transportation costs.

Other subjects reviewed were factors entering into materials handling procedures such as cost reduction materials and containers, labor and equipment, training methods and improvement of working conditions.

Inland Water Rates Pegged

Washington—Ceiling prices for freight shipments over inland water routes in northern United States may not exceed terms of contracts made on or before Jan. 25, 1951.

The office of price stabilization ruled earlier the ceilings applied only to Great Lakes carriage. The new ruling extends the regulation to other inland routes normally frozen over during winter months.

CMP to Meet Truck Trailer Needs

Washington—Truck-trailer manufacturers have been assured a fair share of materials under CMP by the National Production Authority. An interim program has been developed under which the industry's steel, copper, and aluminum needs may be allotted pending start of CMP on July 1.

Great Lakes Orders Ore Boat

Cleveland—Great Lakes Steamship Co. has signed a contract for an 18,000-ton iron ore carrier. Defoe Shipbuilding Co., Bay City, Mich., will make delivery in August, 1952. J. Burton Ayers, Great Lakes president, announced.

The vessel will be the 16th ordered by American operators since the outbreak of hostilities in Korea. Fourteen of the vessels will be iron ore carriers, the others will be self-unloaders to be used chiefly for moving limestone.

Keel of the new carrier will be laid about Sept. 1. The ship will

be 643 ft long, with a 67 ft beam and a depth of 35 ft. Except for certain refinements, in hull construction and an additional hatch, the freighter will be practically a duplicate of the "super" carriers built for Pittsburgh Steamship Co. in 1942.

Add Four Jobs to Critical List

Washington—Four new work classifications have been added in the Labor Dept.'s revised list of critical occupations. They are: Airplane navigator (commercial), metal spinner, ship fitter, and farm operator. The new list with the Dept. of Commerce's list of essential industries is meant to guide deferment policy in calling up reservists and induction by draft boards.

Maurice J. Tobin, Labor Secretary, said overall shortages existing already or developing that will "significantly interfere" with essential industries determines inclusion of an occupation on the department's list.

Big Industrial Truck Order

Philadelphia—A Navy order for 940 gas fluid drive industrial trucks has been received by Yale & Towne Mfg. Co. This is the largest order of its kind in the company's history.



"Now that we're set to roll, I'd like everybody to make suggestions of what we should manufacture!"

BITS AND BRIEFS

By Bill Packard

Price Administrator DiSalle proving every day the value of a sense of humor. How can you fault the guy, the way he keeps joking and keeps smiling? Reminds us of the dentist we saw through gas-fog. "There, now, didn't hurt a bit, did it?" . . . Curtiss-Wright's biggest subcontract yet going to Allis-Chalmers who will make compressors for J65 Sapphire turbo jet engines. A-C building \$5 million plant to employ 4000 at Terre Haute, Ind. . . . Speechmaker Irving S. Olds, alias Joe Jones, winning applause for plain talk on rapid amortization of defense plants. The U. S. Steel chairman made a fine speech because he was sick and tired of hearing "fast tax write-offs" were a form of subsidy. You're right, Joe. It just ain't so . . . International Harvester has arranged with a group of nine banks for \$75 million V-loan to finance military production . . . Frustrated merchant iron consumers seeking aid in Washington. Result: House Small Business Committee has requested NPA to draft a detailed report on pig iron production and who's getting it . . . Consumption of lead for type metal jumped from 2270 tons in December to 3018 tons in January. Could this be printing demand resulting from more government controls? . . . True story: A scrap broker stood in a large railroad yard watching in amazement as car after car of steel scrap rolled by—passing in both directions. Finally, he exploded: "That's where it is. The gol darn stuff's all intransit!" . . . Daystrom, Inc., planning new \$4 million plant in Scranton, Pa., to make fire control equipment for the Navy, reports T. R. Jones, president . . . Controlling prices of manufactured goods proving child's play compared with controlling food prices. Could the difference be partly a matter of conditioning? . . . Leo Durocher

PROPERTY OF MICHIGAN LIBRARIES

should have been a politician. He has no peer when it comes to scoring the opposition, and he views failure on his own team with implacable calm—sometimes... Tom Millsop, president Weirton Steel,

received 87.6 pct of votes cast in last Tuesday's primary election for mayor of Weirton. He already knows the job, since he's been Weirton's mayor since 1947. The citizens seem to be satisfied.

Steelmen Seek Key to Future Market Trends

Study production, consumption trends for key to business outlook... New finishing capacity will change competitive picture... Companies guard plans—By John Delaney.

Pittsburgh—Steel market analysts are ready to settle for an ingot capacity of around 120 million tons, give or take a million tons or so, by January, 1953. They realize there undoubtedly are some projects not yet revealed, but feel these programs will not alter the picture significantly.

Their studies are now in the payoff stage; they are breaking down finishing capacity—by products and areas. They want to know how much and where. Because this is where the competition comes in, the level at which the battle for business really begins and ends.

Every new finishing mill means a change in the competitive picture in the area in which it is located, and in other areas as well. For instance, new sheet and strip capacity at the Fairless Works of U. S. Steel Co., will alter competitive situations not only in the eastern market, but in Pittsburgh as well because the capacity of the company's Irvin Works near Pittsburgh will thus be relieved of tonnage formerly shipped to the east.

Study Capacity, Use—The researchers are also looking into the question of potential consumption versus productive capacity by geographical areas. Some of the tentative answers they have come up with are both reassuring and disconcerting.

One preliminary study shows this pattern: Northeast—production less than consumption; Middle Atlantic—much of new capacity is concentrated in this area

(Delaware, West Virginia, New York, Pennsylvania, New Jersey, and District of Columbia) increase of productive capacity over consumption potential is tremendous; Southeast—surplus of production over consumption; Southwest, Northwest and Farwest—consumption over production by a slight margin.

Gathering information of this kind does not come easy. Individual company announcements on expansion plans quite often are sketchy—and purposely so. As a result the good market expert must be a combination of Dick Tracy and a top flight newspaper reporter. No clue, however slight, is overlooked.

The jig saw puzzle is taking shape, however. It probably won't be long before the last piece is fitted into place.

When all the facts are in and

correlated, the industry competitive pattern will be considerably altered. And when the new capacity is installed and in operation, steel sales forces will be ready to meet it.

This looking ahead attitude indicates steel's desire to put itself on the best possible competitive footing for the uncertain market of the future. Peace some day will bring back spirited sales campaigns. When normalcy will return is a hazardous subject for guessing but one thing is certain—the greater steel capacity seen in 1953 will put a heck of a lot more steel into the competition.

Assails Belief That Fast Tax Writeoffs Are Gift to Industry

New York—Making the tangled clauses of depreciation and rapid amortization laws crystal clear by relating the adventures of "Joe" who started a business, Irving S. Olds, U. S. Steel Corp., chairman of the board, said the wrong attitude is growing in Congress on fast tax writeoffs. He said the false belief is widespread that the law grants a tax subsidy to business and really pays for industry's machines out of the public treasury.

This is untrue, Mr. Olds told the annual meeting of the New York State Chamber of Commerce last week. He said some Washingtonians are using this erroneous belief as a lever for promoting government ownership of defense plants as a cheaper method when it really would be vastly more expensive.

Rapid amortization gives industry the incentive to expand now when needed. It allows the businessman the opportunity to charge off defense machines in a shorter period. While depreciation allowances are greater, profits during the 5 years are that much shorter. Mr. Olds pointed out in his illustration. In the long stretch later absence of the depreciation allowance and consequent greater taxation balances the scales as far as government revenue is concerned.



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Customer Indifference to DO's, End Uses Hurts Him and Producer

Hamilton Foundry sends letter to appeal for customer cooperation.

Hamilton, Ohio—By failing to supply accurate end-use information and DO orders when possible to producers and warehouses, many customers have in turn been ignored when it came to receiving shipments. Industry has been pestered and hampered by this lack of customer interest.

One producer told THE IRON AGE that one customer was leery of turning over end-uses because he feared he might be violating some section of his contract involving security. In a good many cases customers have just snubbed producers' requests for information.

Bad for Both Sides—It leads to a bad situation for both sides. The customer fails to get his goods and the producer can't arm himself with DO's and impressive end-use listings to get materials.

Hamilton Foundry & Machine Co., Hamilton, Ohio, is engaged in a customer education campaign. It is underlining importance of getting DO's and giving end-uses in a letter now being circulated.

"Although we did a careful and thorough job of explanation on the subject in a previous letter," Hamilton Foundry writes, "we had a disappointing and negligible response. We find that many of our customers feel a DO rating means nothing."

Procurement Tougher—Hamilton continued that DO ratings are demanded for defense and supporting programs. Lack of cooperation from customers has made Hamilton's job of material procurement much tougher in recent months because of tightening supply. The firm pointed out that it could "serve customers only as they help us acquire materials and supplies."

Customers were advised that even if their products were not going directly into defense they may be of the defense-supporting nature. Hamilton, producers of

castings for inclusion into a variety of products, charged that customer apathy on end-uses and DO's may have curbed expansion of production.

AEC Scrap Steel Is Studied

New York—The Atomic Energy Commission is investigating ways of sending contaminated steel scrap back to steel mills. AEC safety policies have heretofore prevented disposal of materials contaminated with radioactive elements.

The study will determine exactly how much contamination is permissible without affecting users. New steel contains about $\frac{1}{2}$ part per million of uranium contamination. The present scrap has about 50 to 100 parts per million.

Europe Outbids U.S. for Copper While Holding on to U. S. Imports

Baltimore—Europe has been outbidding the United States for Chilean copper while receiving imports of copper from this country, according to C. Donald Dallas, chairman of the board, Revere Copper & Brass, Inc.

The critical copper shortage was ascribed in part to this leakage. The U. S. stockpiled 500,000 tons of copper in recent years but shipped 90,000 tons abroad under ECA programs during 1950.

Copper imports this year are running 25 pct under 1950. The move by Congress to lift the tariff on foreign copper was described as a step in the right direction.

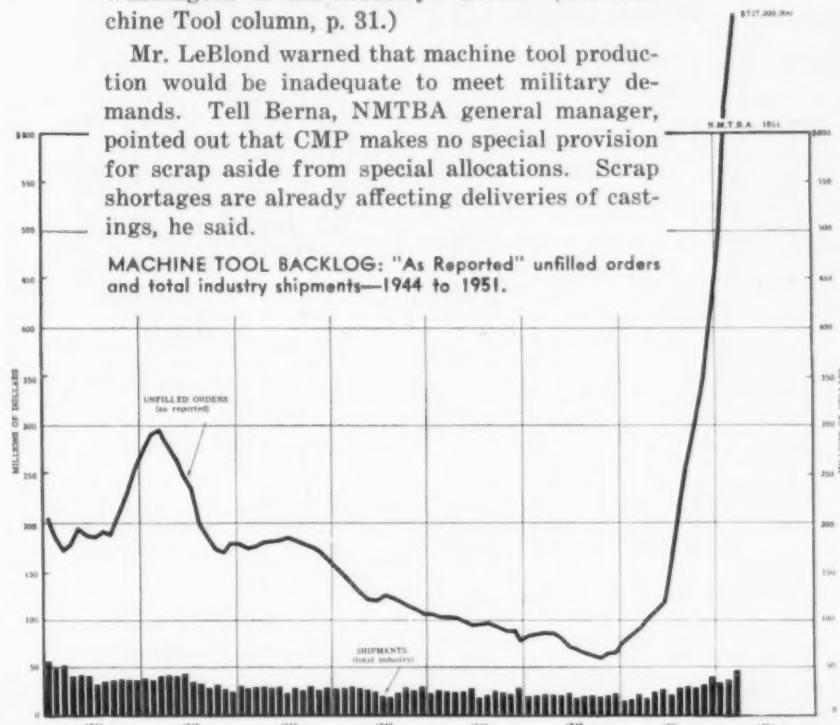
Machine Tool Backlog Spurts to \$727 Million

Chicago—Vital expansion of the machine tool industry is being blocked by manpower shortages, uncertain price regulations, and lack of a blanket priority for materials, it was reported at the National Machine Tool Builders' Assn.'s spring meeting here last week.

R. E. LeBlond, NMTBA president, and M. A. Hollengreen, chairman of government relations committee, emphasized lack of understanding by Washington of the industry's needs. (See Machine Tool column, p. 31.)

Mr. LeBlond warned that machine tool production would be inadequate to meet military demands. Tell Berna, NMTBA general manager, pointed out that CMP makes no special provision for scrap aside from special allocations. Scrap shortages are already affecting deliveries of castings, he said.

MACHINE TOOL BACKLOG: "As Reported" unfilled orders and total industry shipments—1944 to 1951.



CONTROLS DIGEST

Industry Controls This Week:

NPA Orders

M-2, Rubber amendment—Makes available larger amounts of rubber for May civilian consumption. May 1.

M-4, Building controls—Buildings requiring more than 25 tons of steel, apartment houses exceeding three stories, and homes over \$35,000 must get NPA approval. Most work already started may proceed. Effective at once.

M-4, Construction—Amendment clarifies previous order and amendments. Effective May 3, 1951.

M-7, Aluminum use—Permits use to 65 pct of base period of aluminum for residential windows during May and June. Applies to window screen frames, ledger openers, and non-residential type windows except curved head architectural types. May 1.

M-25, Direction 1, tin and terneplate—Tightens provisions of can order to prevent use by packers of tin and terneplate above base period rating. May 1, 1951.

M-32, Chemicals—Amends original order to include distributors. May 1.

M-33, Molybdenum use—Amendment requires substitutions for molybdenum where practical; established procedure for allocation of molybdenum metals; controls disposition of molybdenum containing scrap. May 1.

M-47, Steel for autos—Cuts steel use for passenger autos and station wagons in June. Also limits use for cars and trucks during third quarter.

M-50, Electric utilities—Extends from May 1 to June 1 the right of electric utility companies to use materials on hand in making major plant additions without DEPA approval. May 1, 1951.

M-51, Sched. 1, Glass containers—Specifies standard designs for glass containers. Effective Apr. 27.

M-59, Steel strapping—Limits inventories and restricts use of wire and steel strapping. Effective May 1, 1951.

Reg. 4, Dir. 2, Permits exporters to use DO-97 rating to replacement parts and accessories for machinery and equipment for shipment to foreign countries during May and June. May 1, 1951.

NPA-Del. 10—Delegates authority to Production and Marketing Administration to exercise allocation and priority functions. Effective Apr. 26, 1951.

CMP-1, Defines rights and obligations under CMP, and explains how production schedules will be authorized.

CMP-3, Establishes preference status of delivery orders for controlled and other materials needed for production for the defense program.

OPS Orders

CPR 22, Int. 1, Freight Rates—Some higher freight rates permitted previously by the Interstate Commerce Commission may not be included in figuring prices under CPR 22.

CPR 22, Supl. Reg. 2—Offers alternate methods of establishing ceiling prices. Issued May 1, 1951.

CPR-27, Industrial coal—Permits new higher ceiling price for industrial coal at Lake Superior docks based on July 1, 1948, to June 30, 1949, period, or Jan. 1 to 15, 1951, whichever is higher. Coal dock dealers may add increases in water or rail costs between Jan. 1 and June 30, 1950. Effective May 1, 1951.

CPR 29, Nickel—Establishes ceiling prices on nickel and nickel containing scrap metals. May 8, 1951. (See p. 148.)

CPR-30—Establishes price controls for manufacturers of machinery and related goods. Effective May 28, 1951.

CPR-33, Tungsten products—Establishes prices on domestic and imported tungsten products. Effective May 7, 1951.

SFO Orders

SFO-2, Solid fuels shipment—Establishes procedures for issuing directives controlling shipment of solid fuels. Effective Apr. 30.

OPS Issues CPR 27 Granting Higher Prices for Industrial Coal

Washington—Higher price ceilings for industrial coal have been approved by OPS.

In one action, OPS approved a new basis for establishing ceiling prices at Lake Superior docks. The regulation (CPR 27) provides that ceiling prices shall be the highest prices charged for any size, grade, grouping, or other classification of coal sold at a dock during the base period, July 1, 1948, to June 30, 1949, or the period, Jan. 1 to 15, 1951, whichever is higher.

In another increase, the agency permitted tidewater coal dock dealers to increase their ceiling prices on each size or grade of coal handled by them by the exact amount of their railroad or water transportation cost increases between Jan. 1 and June 30, 1951.

Defense Contracts to Metalworking Industry

Selected Contracts, Week of May 7, 1951

Item	Company
Machine tools	Bridgeport Machines, Inc., Bridgeport, Conn.
Engine lathes	The Lodge & Shipley Co., Cincinnati
Generator sets	General Electric Co., Washington
Diesel engine	GMC, Cleveland Diesel Engine Div., Cleveland
Pump	Nash Engineering Co., South Norwalk, Conn.
Engine lathes	Sidney Machine Tool Co., Sidney, Ohio
Generator set	Bogue-Electric Mfg. Co., Paterson, N. J.
Generators	Continental Electric Co., Inc., Newark, N. J.
Generators	Harvey-Wells Electronics, Inc., Southbridge, Mass.
Pump parts	Electric Boat Co., Bayonne, N. J.
Bearings	Wakefield Bearing Corp., Wakefield, Mass.
Indicators	Bendix Aviation Corp., Burbank, Calif.
Buildings, metal	Pacific Iron & Steel Co., Los Angeles
Buildings, prefab.	Armco Drainage & Metal Products, Inc., Los Angeles
Generator sets	Stewart & Stevenson Services, Inc., Houston
Generator sets	Caterpillar Tractor Co., Peoria, Ill.
Buildings, metal	Steelcraft Mfg. Co., Rossmoyne, Ohio
Meter assemblies	Ralph M. Brodie Co., Oakland, Calif.
Radio transmitters	Collins Radio Co., Cedar Rapids, Mich.
Transformers	McGraw Electric Co., Milwaukee
Grinding machines	Cosa Corp., New York
Dryers	Pako Corp., Minneapolis
Cameras	Bell & Howell Co., Chicago
Turbochargers	Pneumatic Tire Service Co., Huntington Park, Calif.
Indicators	Bendix Aviation Corp., Teterboro, N. J.
Mechanical press	Verson All Steel Press Co., Chicago
Tank-automotive parts	Bendix Aviation Corp., North Hollywood, Calif.
Diesel parts	The Bristol Co., Waterbury, Conn.
Boring machines	Lucas Machine Div., New Britain Machine Co., Cleveland
Oxygen regulators	Bendix Aviation Corp., Teterboro, N. J.
Tractors	Minneapolis-Moline Co., Minneapolis
Steering motors	General Electric Co., Chicago
Sewing machines	Singer Sewing Machine Co., New York

Price Controls Hit Machine, Equipment Makers; Start May 28

Washington—Price controls for manufacturers of machinery and related goods went into effect this week with CPR 30. The new regulation is effective May 28 (see p. 31).

Used machinery and some rental equipment are exempted. The order does not cover resale prices which are expected to be included in a coming supplementary order.

Ceiling prices are set at the pre-Korean base plus increases in materials costs through 1950 and labor costs through Mar. 15, 1951. The base period is Apr. 1 through June 24. Installation and erection services by a parent company or affiliate are covered by the regulation.

Types of commodities covered by CPR 30 include: prime movers, industrial power apparatus, material working and fabricating machinery, machine tools, farm equipment, automotive equipment and parts (except passenger automobiles), insulated electric wire and cable, construction and mining machinery, electrical equipment, railroad and street railway equipment, auxiliary industrial equipment, forgings, screw machine products, stampings, fabricated structural steel shapes, plates and bars, industrial and scientific glassware, marine equipment, aircraft parts, and related equipment, parts for forgings.

ICC Freight Hike Out for CPR 22

Washington—Higher freight rates authorized by the Interstate Commerce Commission on Mar. 12 may not be included by manufacturers in computing higher costs under Ceiling Price Regulation 22.

CPR 22 permits an adjustment of ceiling prices quoted on a delivered basis to reflect increases, between the end of the base period selected by the manufacturer and Mar. 15, 1951, in transportation costs.

NPA Tightens Building Controls

Washington—Effective at once, NPA has amended construction order M-4 extending control to almost every type of building.

Increased tightness of structural steel (THE IRON AGE, May 3, P93) brought on the revision. Specific NPA approval must be obtained for all industrial building requiring 25 tons or more of steel, apartment houses exceeding more than three stories, and homes exceeding \$35,000 in cost. Tight con-

trol will be exercised in granting permits for public construction such as schools, hospitals, and public utilities.

In most cases, work already started on the now banned projects will be allowed to proceed. This is interpreted broadly to include advance excavation work as within the meaning of "commenced."

Tungsten Ore Prices Exempt

Washington—Tungsten ores have been exempted from price control. OPS has also exempted sales to the government of tungsten concentrates produced from foreign ores.

Count All Lids, NPA Rules

Washington—Packers who use aluminum lids and sealing devices must include in their inventory all closures in their possession or held by others for them, NPA has ruled.

Speed MRO Supplies to Allies

Washington—NPA moved this week to expedite flow of MRO supplies to countries outside the Soviet block. The Office of International Trade will receive authority to assign DO-97 ratings to export shipments of these supplies, diesel engine manufacturers were told.

NPA may also amend order M-44 controlling power equipment to permit end use certification.

Cut 3rd Quarter Steel for Cars

Washington—NPA has cut steel usage for passenger autos and station wagons for June from 80 to 75 pct of the first 6 months of 1950.

In amending order M-47, NPA also limited steel for cars and trucks during the third quarter to the following percentages of base-period usage: passenger cars, 70; light trucks, 70; medium trucks, 100; heavy trucks, 120.

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U.S. Import-Export Imbalance Seen Temporary

Imbalance of trade is temporary and necessary . . . Pig iron shipments distort import statistics . . . Mills try to treat exports fairly . . . New markets to open—By Ted Metaxas.

New York—Outcries over January's unprecedented and unfavorable export-import imbalance of the United States ignore two important realities. It is temporary and both natural and necessary to supply huge and extraordinary rearmament needs superimposed on an already virile civilian demand.

The traditional gap of exports over imports was almost bridged in 1950 and finally closed in January 1951 when imports totaled \$1,002 million and exports only \$972 million. Steel and iron can be seen in the "culprit's" lineup for helping foster this situation.

Iron's in the Woodpile—In the final quarter of 1950 imports topped exports, and total 1950 exports of iron and steel products dropped to 3,077,330 tons from a comfortable 1949 level of 5,023,000 tons. Imports leaped from 1949's high 458,000 tons to a summit of 2,028,057 tons in '50. Iron, steel imports were 776,026 tons in January and February and exports only 534,124 tons.

These sad statistics are distorted by the alltime high of pig iron imports—790,317 tons of iron and 144,852 tons of ferroalloys in 1950. Iron and ferroalloy imports in January, February were 284,-

026 tons. U. S. export of these products is negligible.

The need for critical pig iron is emphasized but the notion that foreigners are driving us out of the export market place on finished steel is minimized. European pig has slipped easily into the U. S. gray market as have conversion ingots, and overseas mills have made transient gains in finished steel because of the home shortage.

Distributes Fairly—One exporting mill told THE IRON AGE that although 50 pct of its steel was moving under government directives, the balance was being distributed equitably between export and domestic markets. Less steel for civilian America means less steel for export customers. The 3 million tons shipped by the U. S. in '50 despite the shortage and a relaxing Marshall Plan is a clue to the determination of mills here to keep export affiliations intact.

Stronger Competition — What will steel exporters face in the future? Eastern Europe countries, now the major shippers of steel to the U. S., have with ECA aid revived their industry and are producing over 60 million metric tons of steel annually, or 7.6 million tons above prewar. They will continue to import steel products which they cannot make economically but they never did constitute our major market anyway.

They will be a stronger competitive force. Mills have been modernized, new ones built. The output of more flat-rolled and other products will be more efficient and of higher quality. Their productivity teams have gleaned technical knowledge from the U. S. and the Schuman Plan will weld together previously disjointed resources. They will seek to prowl into America's Canadian and South American markets but their production may be discouraged by acute shortages of iron ore—to strike hard by 1953.

Some steelmen here believe that the pattern of products in U. S. exports may alter—tubing becom-

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"Can You Make It?" Editor
The Iron Age
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ing more important—but volume will increase. The world is moving to industrialization and to a more intense need for steel and machines. They figure that if the U. S. loses some of its European market it will gain a greater one in backward countries just stirring to industry. The Point 4 program will be the lever to open up new demand. It may also yield new sources of raw materials in backward countries.

One export executive told THE IRON AGE that, in the near years, worldwide demand for steel will surpass production and potential demand is comparatively unlimited. Peoples of retarded nations, having come in contact with American technology during the war, will probably favor our machines for their industrialization. Thus mills will ship great quantities of steel to exporting American fabricators and builders.

Change in Plans at Tonawanda

Washington—A switch in plans will result in the manufacture of Wright R-3350 engines at the government-owned plant at Tonawanda instead of the Allison J-35-A-23 turbo jet as previously announced. The plant will be operated by the Chevrolet Div. of GMC. This will cancel plans for the government to construct a plant for Hudson Motor Car Co.

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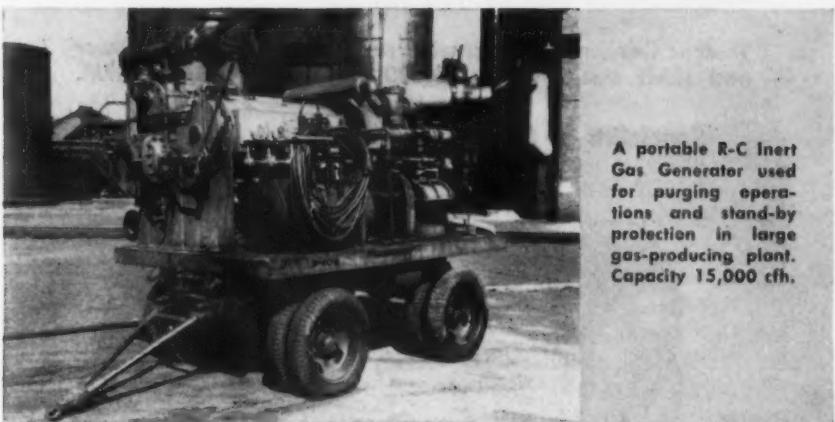


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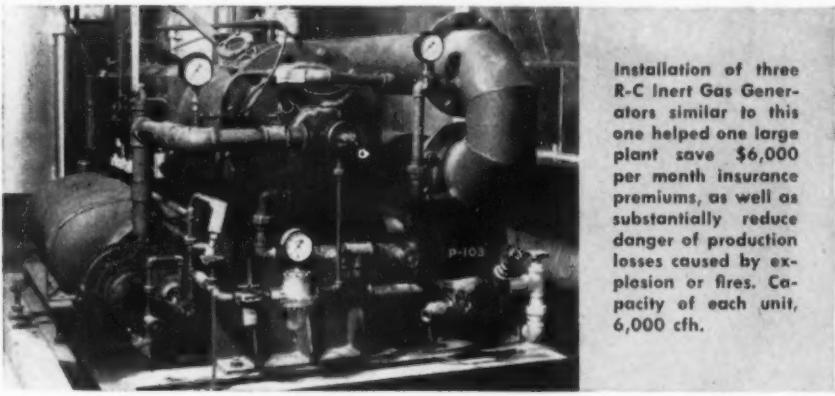
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DPA Grants 98 More Fast Tax Write-Offs for Defense Projects

Washington — The Department of Defense issued 98 new fast tax write-off certificates between Apr. 14 and Apr. 26. The new defense facilities will cost an estimated \$215,277,047. Total eligible for amortization on facilities to date is \$4,797,827,410.

Certifications are listed below by company name, product or use, amount applied for, amount eligible, and pct certified.

Chotin, Inc., transportation, \$572,345, 81%; 000, 80; \$394,345, 70.

New York Transformer Co., Inc., transformers, \$50,000, \$50,000, 75.

Allegheny Ludlum Steel Corp., steel strip, \$3,800,000, \$3,800,000, 70.

The Torrington Co., bearings, \$1,854,937, \$1,645,098, 80.

Towle and Son Co., instruments, \$40,500, \$49,500, 85.

Interstate Engineering Corp., aircraft parts, \$94,826, \$94,826, 85.

Climax Uranium Co., uranium oxide, \$90,023, \$908,194, 90.

Buckeye Cotton Oil Co., wood pulp dissolving, \$26,777,735, \$21,527,735, 65.

Dumont Laboratories, Inc., electronic equipment, \$27,625, \$27,625, 75.

Offshore Oil Transport Co., transportation, \$124,210, \$124,210, 70.

Goodyear Tire & Rubber Co., Inc., tire repairs, \$38,791, \$38,791, 50.

Pacific Valves, Inc., valves, \$45,800, \$45,800, 85.

General Ceramics & Steatite Corp., transformer cores, \$345,263, \$345,263, 75.

Pennsylvania RR. Co., transportation, \$7,908,165, \$7,908,165, 80; \$3,000,000, \$3,000,000, 80; \$555,000, \$555,000, 80; \$1,574,420, \$1,574,420, 80; \$1,799,420, \$1,799,420, 80; \$2,731,330, \$2,731,330, 80; \$6,550,152, \$6,550,152, 80; \$5,525,000, \$5,525,000, 80.

Natona Mills, Inc., netting, \$22,525, \$22,525, 60.

Technicraft Laboratories, Inc., electronic components, \$76,006, \$76,006, 75.

B. F. Goodrich Co., testing tires, \$106,553, \$106,553, 75.

Collins Radio Co., radar equipment, \$903,266, \$903,266, 80.

New Hampshire Ball Bearings, Inc., bearings, \$38,783, \$38,783, 85.

Varian Associates, radar tubes, \$2,455,933, \$2,455,933, 75.

N.H.N. Tool & Die Works, stampings, \$6,314, \$6,314, 75.

Seaboard Air Line RR. Co., transportation, \$157,800, \$127,636, 65.

Kaiser Aluminum & Chemical Corp., calcined dolomite, \$1,173,000, \$1,173,000, 85.

Baltimore & Ohio RR. Co., transportation, \$5,642,160, \$5,642,160, 80.

Electronics Associates, Inc., instruments, \$8,709, \$8,709, 85.

United States Testing Co., Inc., testing, \$11,829, \$11,829, 75.

Norma-Hoffman Bearings Corp., bearings, \$180,000, \$180,000, 75.

Sonnet Supply Co., cutting tools, \$17,091, \$17,091, 90.

Baltimore & Ohio RR. Co., transportation, \$4,534,000, \$4,534,000, 80.

Torrington Co., bearings, \$281,566, \$281,566, 85.

Oil Transfer Corp., barges, \$500,000, \$500,000, 80.

Chotin Transportation, Inc., transportation, \$97,875, \$97,875, 80.

United Drill and Tool Corp., cutting tools, \$201,058, \$201,058, 85.

Coyle Lines, Inc., transportation, \$1,200,000, \$1,200,000, 70.

Tex-Mex Towing Co., Inc., transportation, \$1,031,039, \$131,039, 70.

Pennsylvania RR. Co., transportation, \$1,475,000, \$1,475,000, 80; \$5,200,000, \$5,200,000, 80.

Gish, \$157, \$157.
Miss portation, \$157.
Amer portation, \$157.
Nati tools, \$157.
Balti \$1,569.
John ment, \$1,569.
C. I. \$73,100.
Ska \$22,137.
Buff portation, \$157.
Amer cars, \$157.
Amer \$6,593.
R. & \$52,882.
Star 745, \$80.
Balt \$4,567.
Ste gine p. \$157.
City terns, \$157.
Stan \$22,021.
Penn 143,756.
\$80; \$157.
Whi \$123,111.
Alum \$53,900.
Cos \$2,950.
Dow 000, \$157.
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Rey \$370,000.
Le \$595.
Hog develop 75.
Phil transp 75.
Sou 000, \$157.
Dan \$74,25.
Stu \$61,72.
Kew \$61,72.
Moy 150, \$157.
W. \$202,9.
Gro \$143,3.
Har \$182,5.
E. \$1,227.
Pur 75.
Fer ring, \$170.
Sha ning, \$170.
Che \$1,700.
Sta dolom \$157.
Mis tation, \$157.
Bel casting, \$157.
Ma portat \$157.
Whi \$157.
* N currie

• News of Industry •

Gisholt Machine Co., machine tools, \$324,577, \$324,577, 85.
 Mississippi Valley Barge Line Co., transportation, \$1,075,772, \$1,075,772, 80.
 American Smelting & Refining Co., transportation, \$600,000, \$600,000, 80.
 National Twist Drill & Tool Co., cutting tools, \$835,947, \$835,947, 80.
 Baltimore and Ohio RR. Co., transportation, \$1,569,000, \$1,569,000, 80.
 John Mohr & Sons, construction of equipment, \$236,225, \$169,806, 80.
 C. F. Harms Co., transportation, \$73,100, \$73,100, 90.
 Skagit Steel & Iron Works, winch, \$22,137, \$22,137, 75.
 Buffalo, Rochester & Pitts. Ry. Co., transportation, \$5,330,839, \$5,330,839, 65.
 American Smelting & Refining Co., hopper cars, \$75,000, \$75,000, 80.
 American Steamship Co., transportation, \$6,593,253, \$6,593,253, 80.
 R. & B. Tool & Gauge Co., gauges, fixtures, \$52,882, \$52,882, 85.
 Star Cutter Co., cutting tools, \$545,045, \$401,745, 80.
 Baltimore & Ohio RR. Co., transportation, \$4,567,100, \$4,567,100, 80.
 Steel Improvement & Forge Co., aircraft engine parts, \$169,162, \$169,162, 75.
 City Pattern Foundry & Machine Co., patterns, castings, \$134,911,* \$134,911, 85.
 Standard Lime & Stone Co., dolomitic lime, \$22,022, \$22,022, 85.
 Pennsylvania RR. Co., transportation: \$4,143,750, \$4,143,750, 80; \$4,474,744, \$4,474,744, 80; \$11,050,000, \$11,050,000, 80.
 White-Roth Machine Corp., mining machines, \$122,180, \$122,180, 50.
 Aluminum Ore Co., alumina, \$54,000,000, \$53,900,000, 80.
 Coden Petroleum Corp., benzene, \$2,950,000, \$2,950,000, 85.
 Dow Chemical Co., chemicals: \$70,000, \$70,000, 100; \$433,500, \$433,500, 100; \$200,000, \$200,000, 100; \$630,000, \$630,000, 100; \$100,000, \$100,000, 100.
 Benson Mfg. Co., oil tanks, \$550,000, \$511,127, 80.
 Reynolds Aluminum Co., aluminum pig, \$370,000, \$370,000, 80.
 Le Roi Co., compressors, generators, \$350,595, \$350,595, 70.
 Hogan Laboratories, Inc., research and development, \$14,205, \$14,205, 85.
 Philadelphia, Bethlehem & N. Eng. RR. Co., transportation, \$896,000, \$275,000, 60; \$600,000, 75.
 South Buffalo Ry. Co., transportation, \$1,877,000, \$1,183,000, 65; \$694,000, 75.
 Warren Petroleum Corp., transportation, \$6,986,280, \$6,986,280, 80.
 Southland Towing Co., transportation, \$535,025, \$325,402, 70; \$209,624, 80.
 Dana Corp., gears, \$3,418,583, \$3,418,583, 75.
 Sturges Gin Co., cotton ginning: \$76,250, \$74,250, 65; \$76,250, \$74,250, 65.
 Kearfett Mfg. Corp., instrument motors, \$61,724, \$59,358, 75.
 Moynahan Bronze Co., aircraft hinges, \$241,130, \$241,130, 80.
 W. H. Nichols Co., aircraft engine pumps, \$202,934, \$202,934, 85.
 Growers Gin Co., Inc., lint cotton, cottonseed, \$143,380, \$121,880, 65.
 Harmer & Bowers, grain elevator, \$135,250, \$132,500, 50.
 E. I. duPont de Nemours & Co., titanium, \$1,227,000, \$1,227,000, 90.
 Pure Oil Co., butenes, \$7,140,000, \$7,140,000, 75.
 Ferro Engineering Co., refractory bottom rings, \$280,000, \$255,000, 75.
 Shafter-Wasco Ginning Co., Inc., cotton ginning, \$126,572, \$120,557, 65.
 Chesapeake & Ohio Ry. Co., transportation, \$1,700,000, \$1,700,000, 80.
 Standard Lime & Stone Co., double-burned dolomite, \$679,333, \$679,333, 85.
 Mississippi Valley Barge Line Co., transportation, \$450,000, \$450,000, 80.
 Belle City Malleable Iron Co., electric steel castings, \$1,508,064, \$1,508,064, 75.
 Macon, Dublin & Savannah RR. Co., transportation, \$281,364, \$281,364, 65.
 Wheland Co., guns, \$2,750,000, \$2,697,000, 90.
 * Net amount equals application cost less current or sale value of replaced facilities.

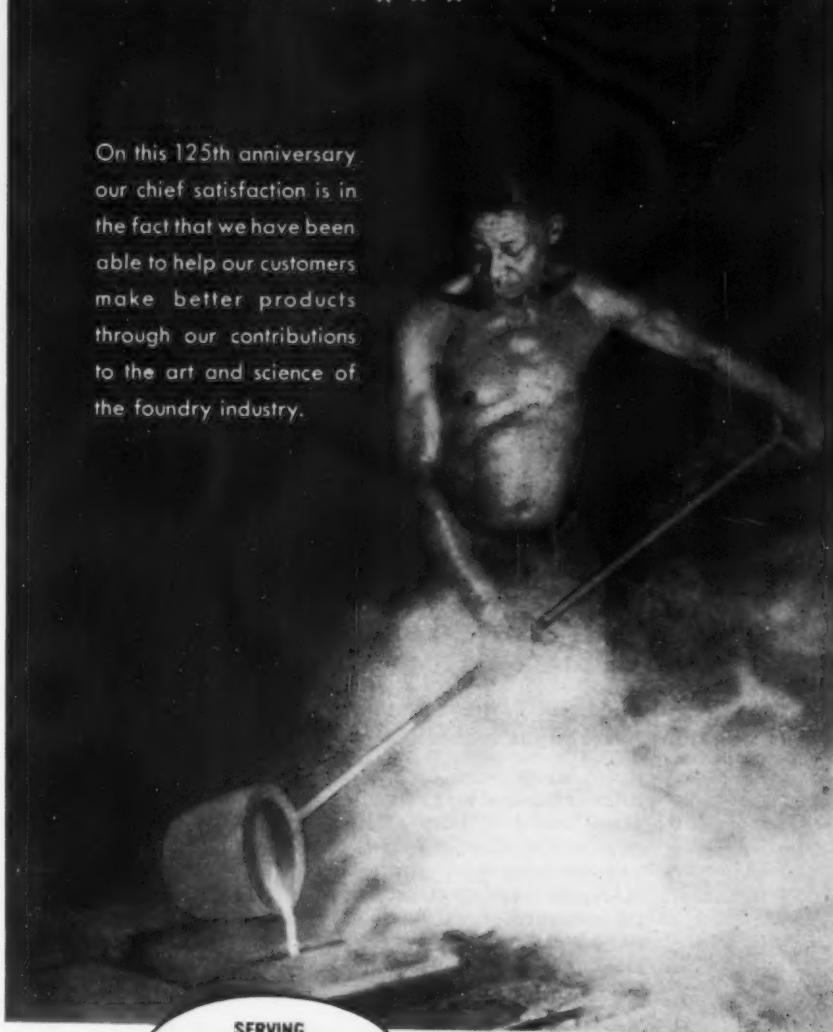
QUANTITY PRODUCTION

OF QUALITY

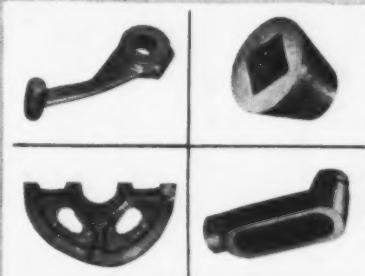
GRAY IRON CASTINGS



On this 125th anniversary
 our chief satisfaction is in
 the fact that we have been
 able to help our customers
 make better products
 through our contributions
 to the art and science of
 the foundry industry.



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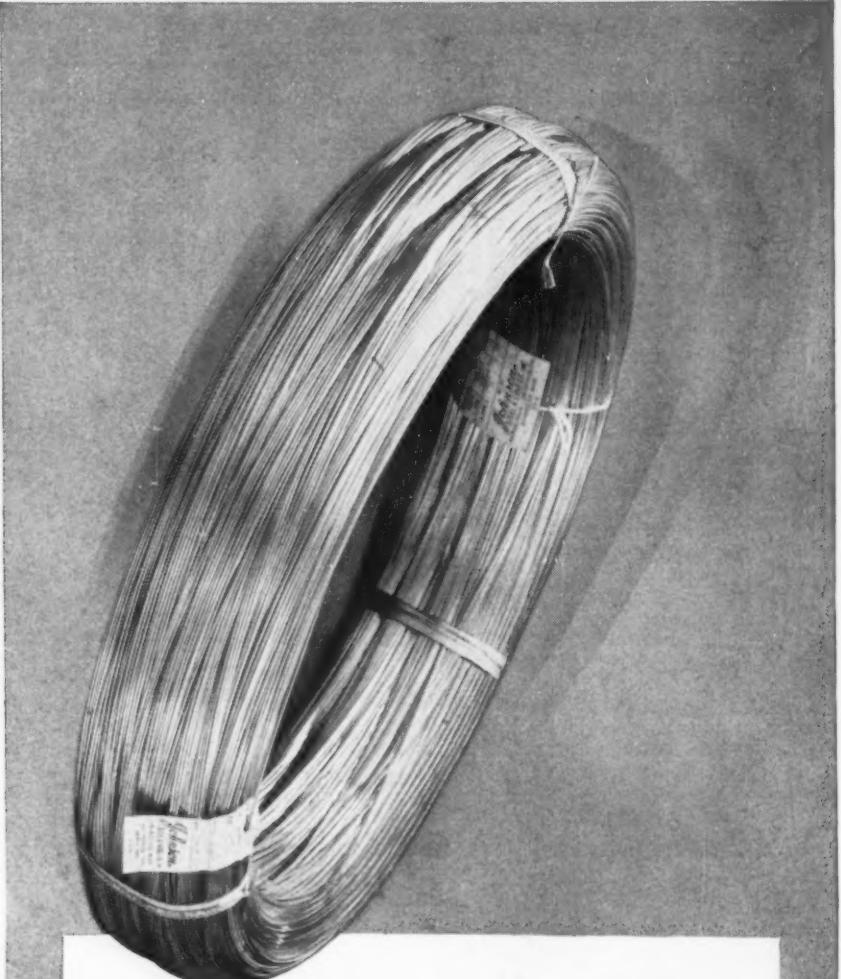


with Gray, Malleable, and
 Ductile Iron Castings

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 FOUNDRIES, Inc.**

**NEWARK MALLEABLE
 IRON WORKS**

357 Wilson Avenue
 Newark 5, N.J.



For specialty wires—a specialty mill

Wires as fine as .003" made to meet your exacting specifications by Johnson specialists, quality producers of:

MUSIC SPRING WIRE.
AIRCRAFT CABLE WIRE.
BRUSH WIRE FOR HAND AND POWER BRUSHES.
HOSE REINFORCEMENT WIRE (BRAIDED TYPE).
VACUUM HOSE WIRE.
FLAT AND HALF OVAL SPECIAL SPRING WIRE.
OIL TEMPERED SPRING WIRE.
HARD DRAWN SPRING WIRE.
HIGH CARBON ROPE WIRE.
HIGH TENSILE GALVANIZED STEEL WIRE.

Bright drawn, tinned, galvanized, liquor finish, copper coated, bronze plated, alloy coated.

Johnson sets the standard of the industry

JOHNSON

STEEL AND WIRE COMPANY, INC.
WORCESTER 1, MASS.

New York Philadelphia Cleveland
Atlanta Houston Tulsa Detroit Akron Chicago
Los Angeles Toronto

Du Pont Finds Microscopic Silica Balls Thicken Lubricants

Wilmington, Del.—Microscopic silica balls one-millionth of an in. in diameter named GS-199S by Du Pont Co.'s Grasselli Chemical Dept. may improve lubricants as a thickener. News of the new material was disclosed at Thursday's, May 10, dedication of the \$30 million addition to the Du Pont Experimental Station.

The fine silica floats on water because of special processing and will not separate out of grease. Du Pont researchers were originally interested in investigating silica structure but saw from the unusual properties of the finely divided silica that it could create advantages for lubrication.

Getting Electric Furnace, Bar Mill

Oklahoma City, Okla. — The Hoster Steel Corp. of this city is now installing an electric furnace and a bar mill which is scheduled to be in operation in August.

The bar mill was formerly installed at Old Dominion Iron & Steel Corp., Richmond, according to Edward Ehlers of Rockaway (N. J.) Rolling Mills, who handled the sale and transfer of the equipment to Oklahoma.

Breaks Half-Century Link

Philadelphia—Harry S. Goldstein, former president of the National Waste Materials Dealers, Inc., has severed a 55-year connection with L. Goldstein's Sons. Mr. Goldstein, a consultant to OPS and a former WPB consultant, has not announced immediate plans but will continue in the same business.

Carbide Kits for Shell Makers

Detroit—A shell machining kit covering handling and use of carbide cutting tools has been prepared by Carboly Co., Inc., for use by manufacturers with shell production contracts. Kits are registered and will be delivered by field engineers.

New York State Towns Boom As J&L Enlarges Benson Mines

J&L's \$7 million project to increase magnetite iron ore output 30 pct.

Clifton, N. Y.—When a community's industry fails, it had better get a new one or go the way of all ghost towns. But when industry booms the community booms right along with it, matching the pace to fit the industry's needs.

Two towns near Jones & Laughlin Steel Corp.'s Benson Mines in northern New York State are sharing in the benefits of industrial expansion. Their growth is based on J & L's all-out development of the mines, world's largest open quarry pits for magnetite iron ore.

Production Higher—Output increased from 366,000 tons in 1944, first full year of production, to more than 1 million tons in '50. Now J & L is putting through a \$7 million project that will boost output by another 30 pct by 1952.

The towns of Clifton and Fine are moving with the tide. Their population has more than doubled in the past decade to 6500. A new school and hospital are under construction, a 50-home housing project is being proposed, and blueprints are ready for a new water system. And there's more in the wind.

The area's two main industries—Benson Mines with almost 600 employees and Newton Falls Paper Mill with nearly 300—are pitching in with the village folk to set the town construction projects going. The future looks prosperous for all.

J & L leased the mineral lands of the Benson Iron Co. in 1941, and construction of the plant was begun by the Defense Plant Corp. in 1942. Part of the land is leased from the Newton Falls Paper Co.

Recruit Italians for Welsh Mills

London—The Welsh tinplate industry has recruited 250 Italians to work in Welsh mills. The men, from the Milan area, are expected to arrive in Wales during May.



THIS MAN FITS INTO YOUR DEFENSE PRODUCTION PLANS

When you get an order that calls for metal cleaning, be sure to call your Wyandotte Representative. He can put Wyandotte's vast technical knowledge at your disposal to help you in your conversion plans.

During, and since, World War II, a large part of Wyandotte research and production facilities has been devoted exclusively to metal cleaning. This is the background your Wyandotte Representative can offer you. Let him go over your contract, recommending the procedures and products* that will give you the best metal-cleaning operation.

Wyandotte is your dependable source of cleaning supplies. Production is dependable because raw materials come from Wyandotte owned and operated sources. Deliveries are dependable because supplies come from Wyandotte's nationwide warehouses, ready to meet your normal or emergency production requirements.

So whatever your cleaning needs may be, call or write your Wyandotte Representative. You'll find that he knows his business.

*Wyandotte offers products which meet the process requirements of JAN-C-490 Grade II, Type 2 and 6.



THE WYANDOTTE LINE—products for burnishing and burring, vat, electro, steam gun, washing machine and emulsion cleaning, paint stripping, acid pickling, related surface treatments and spray booth compounds. An all-purpose floor absorbent: Zorball. In fact, specialized products for every cleaning need.

WYANDOTTE CHEMICALS CORPORATION
WYANDOTTE, MICHIGAN

Service Representatives in 88 Cities

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REG. U. S. PAT. OFF.

Department of the Army

STAND-BY INDUSTRIAL PLANTS

FOR LEASE

AMMONIA and METHANOL PLANT

Morgantown Ordnance Works, Morgantown, West Virginia

Ammonia & Methanol Plant—Capacity per month: 18,700 tons of anhydrous ammonia, or 4,000,000 gallons of refined methanol plus 5,000 tons of anhydrous ammonia.

Hexylamine—Capacity per month: 4,000,000 lbs.

Formaldehyde—Capacity per month: 5,200,000 lbs.

COKE OVENS—74 Wilputte under-jet by-products ovens. Capacity per month approximately 35,000 tons. Will be turned over to successful bidder in operating condition. Bids are being solicited on the following basis:

- The entire plant.
- The plant without the coke ovens.
- The coke ovens alone.

BIDS WILL BE OPENED 14 June 1951

District Engineer

Louisville District, Corps of Engineers
830 West Broadway, Louisville 1, Kentucky

CHLORINE and CAUSTIC SODA PLANT

Redstone Arsenal, Huntsville, Alabama

Hooker Type S Chlorine Cells, capacity per day: 100 tons, with an equivalent amount of caustic soda.

Buildings completely equipped. Excellent transportation facilities. Machinery, equipment and utilities in operating condition. Facilities are presently leased to Solvay Process Division, Allied Chemical & Dye Corporation. New lease will be effective 15 December 1951.

BIDS WILL BE OPENED 11 June 1951

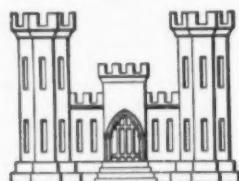
District Engineer

Mobile District, Corps of Engineers
2301 Grant Street, Mobile 7, Alabama

Leases will be consummated through competitive bids. Sealed bids for the lease of these facilities will be received at the office of the District Engineer having jurisdiction. Detailed information, arrangements for inspections and bid forms may be obtained from the Real Estate Division of the District in which each plant is located.

CORPS OF ENGINEERS

U. S. ARMY
WASHINGTON, D. C.



STEEL CONSTRUCTION NEWS

Fabricated steel awards this week included the following:

4500 Tons, Chicago, Congress Street expressway, elevated structure between P. O. building and Halsted St., to Applied Structural Steel Companies.

4300 Tons, Chicago, Hotpoint, Inc., building to Jos. T. Ryerson and Son.

1000 Tons, Gary, Ind., Taylor Pipe and Forge plant to American Bridge Co.

500 Tons, Towanda, Pa., Industrial plant for Sylvania Electric Products, Inc., to Milton Steel Supply Co.

420 Tons, Cook County, Ill., state highway project 42SF-9 to Bethlehem Steel Co.

415 Tons, Sweetwater County, Wyo., bridge project S-264/C to Pittsburgh Des Moines Steel Co.

300 Tons, St. Clair County, Ill., bridge project 146-F to Illinois Steel Bridge Co.

180 Tons, Cook County, Ill., bridge project 062-3434.3GFT to American Bridge Co.

130 Tons, Camden, N. J., building for Universal Rundle Corp., to Robinson Steel Co.

Fabricated steel inquiries this week included the following:

3891 Tons (structural carbon and silicon steel), Boston, Mass., steel superstructure for single and double deck elevated highway structure from North Station to Lowell St. and Leverett Circle, West End. Fred D. Sabin, Cambridge, district engineer. Completion date is June 30, 1953.

1200 Tons, Lester, Pa., building addition for Westinghouse Electric Corp., pending.

650 Tons, Philadelphia, manufacturing plant for National Union Radio Corp., pending.

480 Tons, Green River, Ky., power plant unit No. 3 for Kentucky Utilities Co.

129 Tons, Frankford, Pa., Frankford elevated railroad station alterations bids due May 16.

Reinforcing bar awards this week included the following:

900 Tons, Trenton, N. J., Naval Air Testing Laboratory, Daniel J. Cronin Newark, low bidder.

600 Tons, Chicago, Gertrude Dunn Hick Memorial Hospital, University of Chicago, to Ceco Steel Products Co., Chicago.

330 Tons, Excelsior, Minn., Minnetonka High School, to U. S. Steel Supply Co.

320 Tons, Chicago, auxiliary outlet sewer Ainslie St., to Joseph T. Ryerson and Son.

210 Tons, Milwaukee, P. O. garage to U. S. Steel Co.

110 Tons, Chicago, auxiliary outlet sewer La Salle St., to Joseph T. Ryerson and Son, Chicago.

100 Tons, Boston, repairs to the viaduct at Commonwealth Pier, to James S. Kelliher, Quincy, Mass.

Reinforcing bar inquiries this week included the following:

1200 Tons, Chicago, apartment building 74th and Lake Shore Drive.

270 Tons, Allegheny County, Pa., Hackmeister, Inc., factory.

254 Tons, Boston, Mass., substructure for single and double deck elevated highway structure with approach from North Station over the station's Boston and Maine RR. track to Lowell Street and Leverett Circle, West End. Fred D. Sabin, Cambridge, district engineer. Completion date June 30, 1953.

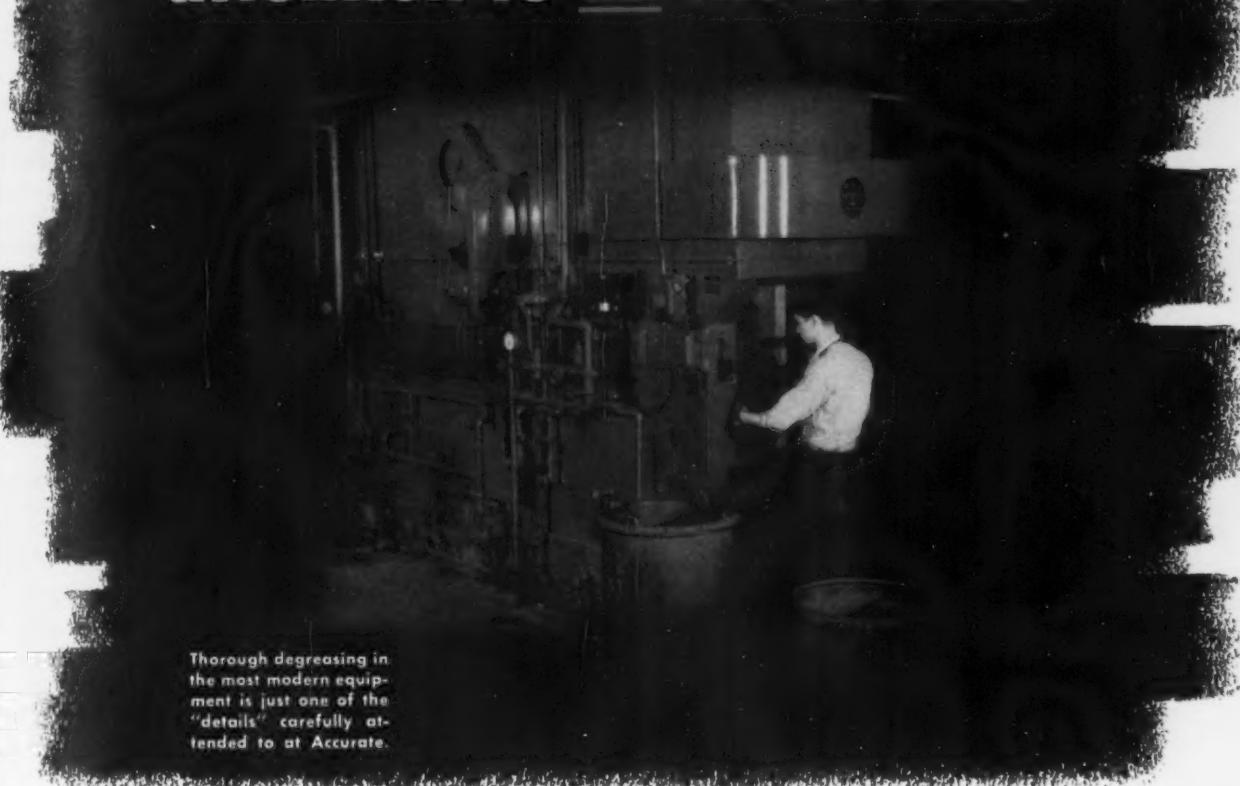
210 Tons, Aurora, Ill., West End school high school.

210 Tons, Vandalia, Ohio, Aero Products Co.

150 Tons, Chicago, O'Hare Field.

At Accurate attention to all the details

Thorough degreasing in
the most modern equipment
is just one of the
"details" carefully attended to at Accurate.



lowers the overall cost of your springs

THE manufacture of springs, like the manufacture of your product, is *the sum of details . . .* and the attention *each* of these details receives determines the quality of the finished product. Here at Accurate, we feel that no detail is too minor to receive the careful attention of our skilled springmakers. The result: precision springs that exactly meet your specifications and do their part in assuring the fine performance your product was designed to give . . . and because of the rigid adherence to your specifications assembly is speeded up, inspections simplified and rejections minimized. This means substantially lower overall costs for you.

Be sure the
springs you
buy are
Accurate

The best way to find out what Accurate can do for you is to give us a trial. For a quotation just send a drawing and specifications or, if you prefer, Accurate engineers will be pleased to assist you with your spring design problems. ACCURATE SPRING MFG. CO., 3819 West Lake Street, Chicago 24, Illinois.

Write for your copy of the new revised Accurate Handbook of Technical Data on Springs. This booklet has been out of print for some time and if you have previously requested a copy and have not received it, we would appreciate your asking again.



Springs
Wire Forms
Stampings

*Accurate
Springs*

• News of Industry •

**See 5 Million Car Output In
1951; Trucks Will Top 1 Million**

Production in first 4 months of '51
400,000 units over '50 period.

Detroit—Despite the Detroit Street Ry. strike and a cutback in production at Hudson, auto output continues at a high level. Automotive News estimated auto assemblies during the week ended Apr. 27 would total 154,421 units against 155,894 for the previous week.

The trade paper says the first 4 months production will total 2,108,000 cars and 511,000 trucks—about 400,000 units more than the same period of 1950.

The brightest spot in the automotive picture today is the continued high production of trucks. Many are government units but civilian demand is also high.

Despite Washington predictions that the steel pinch may ease, the industry is looking for a substantial reduction in car schedules during the last half of 1951.

With the defense program lagging somewhat in production the industry believes it can assemble 5 million passenger cars during 1951. Substantially more than a million trucks should be turned out.

Quarter's Heavy on Civilian Sales

New York—First quarter sales of the Fruehauf Trailer Co. were nearly all taken up by civilian truck-trailers and still a backlog of \$50 million remains. Production on government orders is in the early stages and "only a relatively few units" have been built for the \$100 million in government contracts received so far, reported Harvey C. Fruehauf, chairman, and Roy Fruehauf, president.

Net sales and net earnings for Fruehauf in the first quarter were at an alltime high. Net sales were \$41,465,126 against 1950's \$21,715,582. Net earnings were \$2,405,535 in the '50 first quarter as compared with \$1,371,016 last year.

You can
clean

MORE CASTINGS PER DAY

with
Certified "Abrasives"

Switch to Certified Abrasives and keep cleaning costs down! Certified's Samson Shot and Angular Grit are made extra tough by a special automatically controlled hardening process. They wear longer, can be used over and over again . . . and assure fast, efficient, high-quality blast cleaning. Try Certified in your cleaning room and you'll see why it's first choice in hundreds of foundries!

All sizes graded to S. A. E. specifications

Experienced
foundrymen say:

*Always specify
"Certified"*

Accepted and used for over 55 years

PITTSBURGH CRUSHED STEEL CO.

Pittsburgh, Pa.

STEEL SHOT AND GRIT CO.

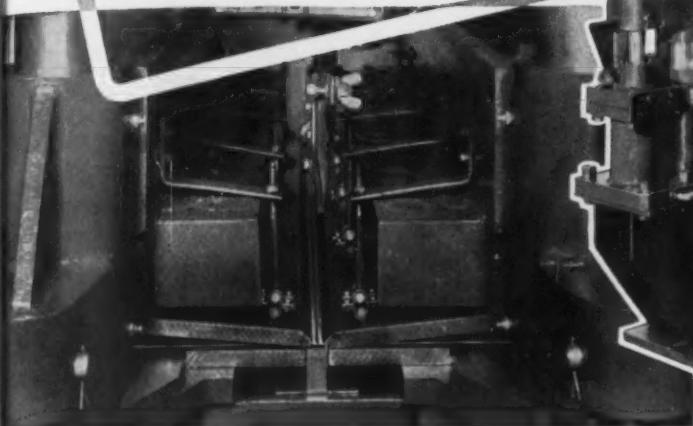
Boston, Mass.



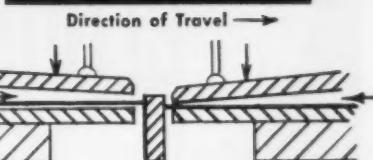
New SECO STRIP SPLICER

Welds Coils Together

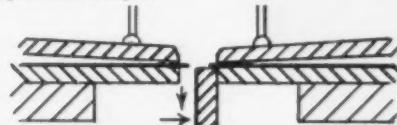
For Faster Processing
and Continuous
Cold Reduction



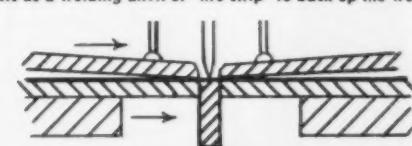
HOW IT OPERATES



1. The tail end of the outrunning coil is brought squarely against the stop gauge and clamped firmly against a copper bar on the platen by a copper clamping bar. The front edge of the oncoming coil is then similarly aligned and clamped.



2. The stop gauge retracts and moves forward $\frac{1}{2}$ inch, squarely under the tail end of the outrunning coil. It now acts as a welding anvil or "fire strip" to back up the weld.



3. The complete entry platen moves forward one inch, bringing both coil ends exactly together over the center line of the fire strip. The sheared ends of both coils are now accurately positioned-ready to be welded.

4. The operator presses one push-button, which automatically starts the weld, permits the electrode to make contact, opens the flux valves and starts the welding head carriage travel. Adjustable limit switches start and stop the weld according to strip width. At completion, the welding head returns to starting position and both clamping bars are immediately raised six inches, allowing the strip to travel at normal line speed. Surplus granulated flux is removed by a flux reconditioning unit.

New Semi-Automatic Machine Speeds Up Processing Lines

You can save time and effort in handling strip steel with the new SECO Strip Splicer—designed to form a continuous welded strand for faster processing. More efficient than mechanical stitching or spot welding, the SECO Splicer uses submerged melt arc welding—permitting continuous cold reduction.

Operation is semi-automatic. Strip is welded quickly and efficiently with no waste time. A stop gauge and air-operated side guides accurately position the coil ends—which are automatically welded together. Various material thicknesses and widths are accommodated by adjustable automatic controls.

The SECO Strip Splicer shown has a working width of 56", handling strip from .060" to .183" thick. The design can easily be adapted for your requirements. Write today for full information.

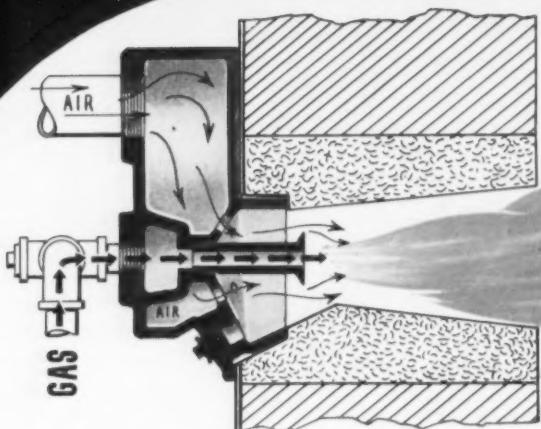
STEEL EQUIPMENT CO.

SECO

2890 EAST 83rd ST.
CLEVELAND 4, OHIO

Designers and Builders
of Steel Mill Equipment

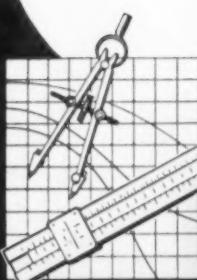
For High Efficiency and Maximum Flexibility in Industrial Furnace Operation...



BLOOM *Long flame* BURNERS

Due to the luminous, high heat-radiating flame produced by the Bloom LONG FLAME Burner, exceptionally uniform temperatures can be maintained throughout the furnace chamber. By eliminating hot spots and cold spots, you get high quality work, improved furnace production and greatest economy.

This burner permits maximum flexibility in furnace operation, for it functions efficiently at temperatures from 400° F. to 2450° F. It will light at full capacity and burn as long as it has fuel. Available in various capacities, adjustable and non-adjustable types, for oil, gas and oil or gas. For maximum furnace production and minimum fuel consumption, install Bloom LONG FLAME Burners.



BLOOM
ENGINEERING CO., INC.

857 W. North Avenue Pittsburgh 33, Pa.

Turns 50 Pct to Defense Work

Warren, Ohio—American Welding & Mfg. Co. has turned over 50 pct of its output to D.O.'s. William J. Sampson, Jr., reported at the annual meeting that operation of the Building Products Div., manufacturing interior doors, frames, and closet door units, has been continued in spite of shortages.

He said first quarter shipments were twice the dollar volume of the corresponding period in 1950 and business outlook for the rest of 1951 is good, depending on availability of materials and skilled labor. Mr. Sampson explained American Welding has gone heavily to defense because it supplies jet engine rings to U.S. and Canadian builders.

England Short of Alloy Steel

London—England faces a shortage of alloy steels because it lacks nickel, tungsten and molybdenum.

Nickel use has been cut in an effort to ease the situation. After May 1 stainless steel users will get 70 pct of 1950 deliveries. Nickel anodes for plating will be cut 50 pct. Less essential uses of nickel are prohibited entirely.

Hopes for improved supplies of tungsten and molybdenum hinge on international talks. Alloy steel specifications will be reexamined to effect savings. Mining of tungsten ore in Great Britain will be resumed.

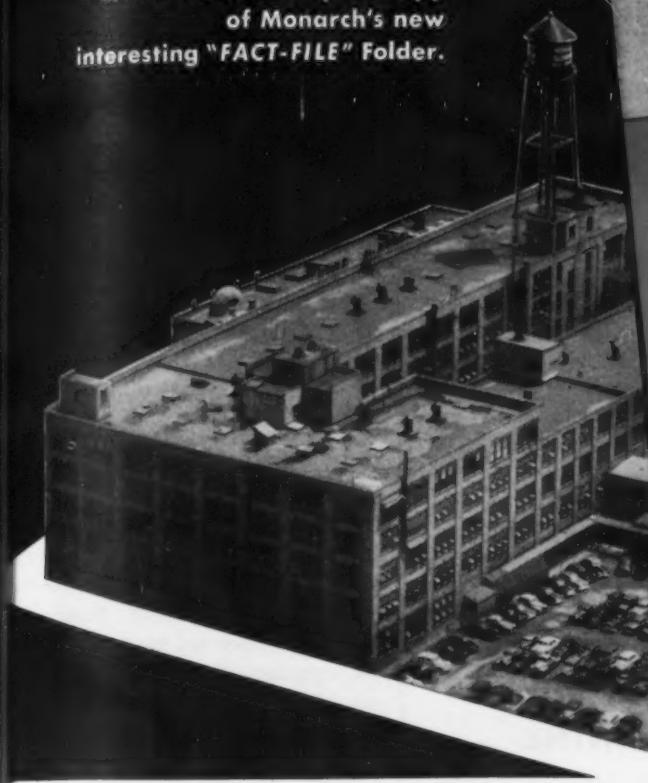
Detroit Steel Net Doubles

Detroit—Net profits of \$3,315,567 during the first quarter, 1951, have been reported by Detroit Steel Corp. and subsidiaries. During the same period a year ago the company earned \$1,369,737.

Plan Denver Warehouse, Office

Chicago—International Harvester Co. has let contracts for construction of a new warehouse and sales office at Denver. The project will cost \$1.5 million and will be ready by late 1952.

WRITE TODAY for your copy
of Monarch's new
interesting "FACT-FILE" Folder.



MONARCH OFFERS MORE than just castings

Monarch's Mobilized Facilities represent an unusual type of integrated service... which few foundries are in a position to offer. These facilities are available for many individual services which may be completely independent of casting requirements.

Monarch's casting production in aluminum permanent mold, aluminum and certified zinc die castings is recognized throughout industry. Monarch offers the obvious benefits of this coordinated service... *in one plant, under one management.*

Monarch's modern trimming and machining methods are capable of meeting unusual mass production requirements within all specifications for quality control.

Monarch's unusual finishing facilities, including

complete production of commercial products, offer modern assembly capacity with skilled personnel. Monarch can assume assembly operations to relieve your production problems or eliminate multiple sub-contract operations.

Monarch Offers More Than Just Castings... an integrated service organization worthy of your consideration on your current defense planning problems.



MONARCH ALUMINUM MFG. COMPANY • Detroit Avenue at West 93rd Street, Cleveland 2, Ohio



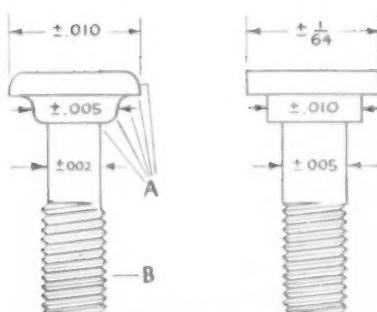
◀ LOW COST COLD HEADING

▼ HIGH COST MACHINING

A cold headed fastener is made from wire, usually the same in diameter as the shank, and headed up to the large portions. The thread (B in diagram) is rolled up from the shank diameter wire to the same outside diameter as a cut thread. Scrap loss is negligible — a vital consideration when national emergency requires the utmost utilization of valuable material.

In contrast, a machined fastener must be made from bar stock equal in size to the largest part of the blank. Material cut away by machining down to the required shape and dimensions represents considerable scrap loss.

Knife-sharp corners and undercuts require second operation machining at increased cost — whereas generous radii and fillets (A in diagram) decrease cost and add strength.



Before your designs reach the blueprint stage, investigate HOLTITE'S Cold Heading Process. It offers a wide range of possibilities in the fabrication of fasteners and machine parts at a substantial saving in cost and metal, plus greater strength, close tolerances, flawless quality and high speed production. Send for free folder "Cold Heading Hints".



Joins French Legion of Honor

New York—Charles M. Muchnic, a director of United Engineering & Foundry Co., was awarded the French Legion of Honor with the rank of Chevalier. Engaged in foreign trade for his company, Mr. Muchnic was recognized for "eminent services rendered to the economic reconstruction of France." He holds a special silver medal from France's Gen. Pétain, awarded after World War I.

Special Shipyard, Depot Trailers

Cincinnati — Trailmobile Co. will make military type trailers for specialized use in shipyards and Army depots. William A. Burns, Jr., vice-president, said the trailers would be built in the firm's Berkeley, Calif., plant. For security reasons, he said, amount of contract or number of units could not be revealed.

Report on Engineers' Deferment

New York — Procedures for requesting occupational deferments and delays for reservists and draftees have been made available by the Engineers Joint Council. The group's Engineering Manpower Commission Bulletin 1 aims at aiding industry in best use of engineering personnel.

Productivity Team to Sail May 17

London—An iron and steel productivity team will sail from England on May 17 to make a 6-weeks' tour of American iron and steel plants. Sponsor is Anglo-American Council of Productivity with ECA technical assistance. Team leader will be Sir Charles Goodeve, director of the British Iron & Steel Assn.

Sick Benefits Top \$30 Million

Pittsburgh — Benefits of \$30,146,000 were paid in the first year of operation of the United Steelworkers-Industry Hospital Insurance program. The program covers 2,484,000 steelworkers and their families.

READ THIS LETTER FROM A TYPICAL "E" STEEL CUSTOMER

J&L STEEL

Screw Products Company
INC.

check these points

Mr. Little
Jones & Laughlin Steel Corporation
Pittsburgh Building
Pittsburgh, Pa.

Dear Sir:

We regret having been so slow in replying to your recent letter, but will attempt to give you some of the information for which you requested in regards to our experience with J&L E-33 steel.

We used a 1" R.A.6 Acme Gridley Automatic Screw Machine; the indexing time is approximately 1 second.

We are making a small Hub which is Drilled, Co. Bored, Formed and Tapped, but the time of the operation is limited to the time required to Drill and Co. Bore. We use a 5/16" cam on the tool slide for this operation.

Stock size is 5/8" Rd. on B-1113 C.R.S. We ran 1300 R.P.M. and used a feed of .003" per revolution.

On E-33 steel we were able to run 1800 R.P.M. and use a feed of .0035" per revolution, which resulted in a net savings of 2 seconds per piece or 33%.

At this speed on the E-33 C.R.S. we found the finish on the part to be better, the tool life longer by approximately 50% which greatly reduced our down time for tool changes and reduced our rejections as well.

We took the job during a period when things were very competitive and work was scarce, and actually took this work on almost a break even basis, with our cost based upon using B-1113 C.R.S. But when we started using the E-33 C.R.S., we found that instead of having a dollar trading job on our hands we had converted it into a very good piece of business indeed.

We have also used this E-33 steel on various other parts in sizes ranging from 1/4" dia. to 2 11/16" dia. and it is our opinion that, if the full advantage of the increased machinability is taken, the savings obtained more than offsets the increased costs of this type material even in the larger sizes.

In closing we have only one serious complaint to register and that is, why isn't there more of it available?

Very truly yours,



You can get real economies too by using J&L "E" Steel. Send for a free copy of our book, "A Progress Report on 'E' Steel." It lists grades available, physical properties and tells how others have used free-machining "E" Steel to advantage.

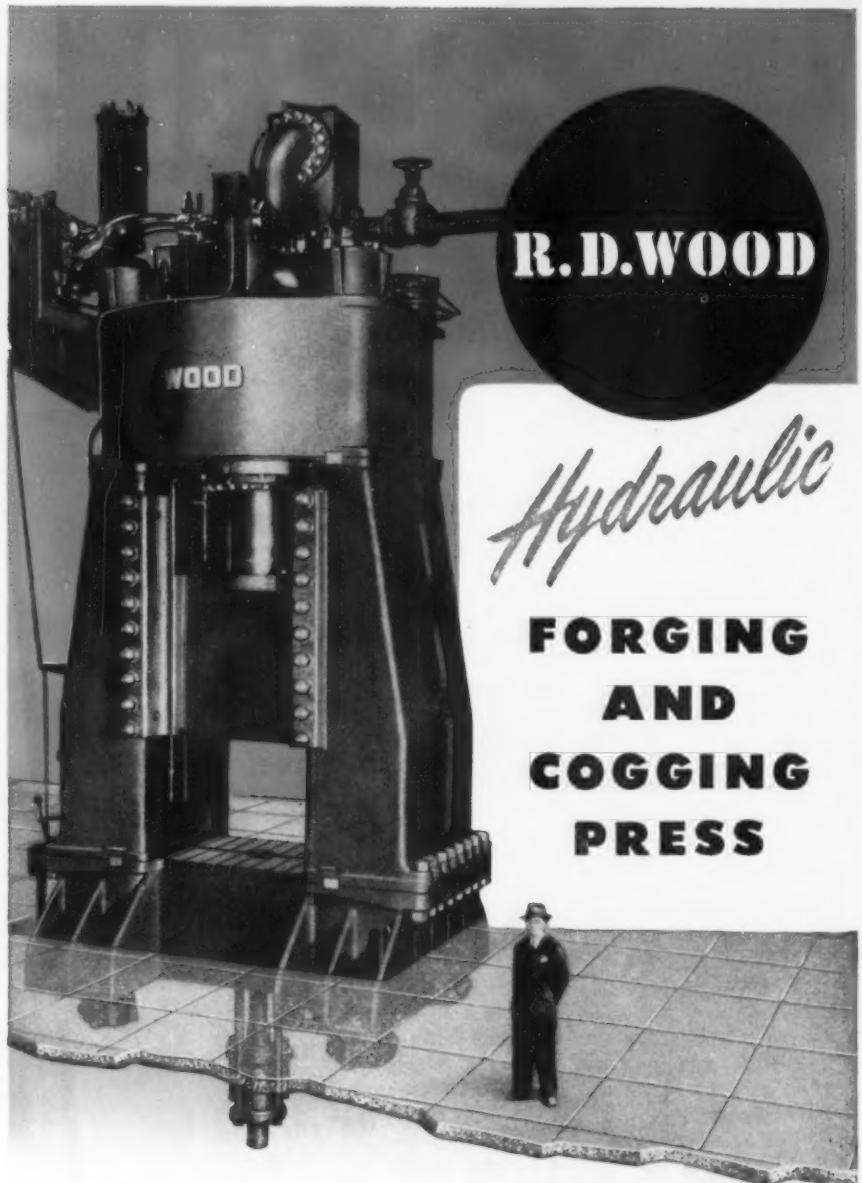
J&L "E" STEEL IS EASILY IDENTIFIED BY THE DISTINCTIVE BLUE COLOR ON THE END OF EVERY BAR.

JONES & LAUGHLIN STEEL CORPORATION

403 JONES & LAUGHLIN BUILDING

PITTSBURGH 30, PA.

From its own raw materials, J&L manufactures a full line of carbon steel products, as well as certain products in OTIS-COLOY and JALLOY (hi-tensile steels).
PRINCIPAL PRODUCTS: HOT ROLLED AND COLD FINISHED BARS AND SHAPES • HOT AND COLD ROLLED STRIP AND SHEETS
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This big hydraulic press is designed and built for continuous heavy duty operation at high speeds. In die forging and ingot cogging, in addition to general press service of forming, forcing, upsetting and impact extrusion of all metals, this press is virtually unaffected by fatigue of impact shock, hydraulic surges, rapid stress reversals and similar factors. Supplied in 1500 and 3000 ton capacities, the press is down-working, and accumulator operated.

Press control is accomplished by a patented R. D. Wood system, permitting a sensitivity of operation heretofore unattainable. Pressure and speed are perfectly controlled; instantaneous stopping or reversal of the stroke is possible at any point. Write for complete information.

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R.D. Wood Company

PUBLIC LEDGER BUILDING, PHILA. 8, PA.

publications

Continued from Page 36

this new Dymo line are color identification of abrasive stone grades complementing that used for the diamond compound, and a complete selection of standard sizes and shapes in the other items. Industrial Products Div., Elgin National Watch Co.

For free copy insert No. 9 on postcard, p. 37.

Humidity Control

Product processing conditions with temperatures as low as -60°F can be maintained by the latest application of the Kathabar humidity control system, described in a new 4-p. bulletin presenting several new features in low temperature conditioning. It tells how air is delivered from the unit without the slightest formation of frost on refrigeration coils; there is practically no limit to the dew point obtainable, and the equipment can operate independently of room or outside conditions in producing the desired processing atmosphere. Typical flow diagrams of actual installations are shown. Surface Combustion Corp.

For free copy insert No. 10 on postcard, p. 37.

Facts on Lime

A new 42-p. booklet discusses the many diverse chemical lime uses, divided into the following categories: metallurgy, pulp and paper, chemicals, water treatment, sewage-trade waste treatment, ceramic products, building materials, protective coatings, food and food by-products, and miscellaneous uses. A technical data section gives the principal chemical and physical properties of lime, including such data as solubility, pH, strength of lime suspensions, specific vents, crystalline structure data, and neutralization values. National Lime Assn.

For free copy insert No. 11 on postcard, p. 37.

For Vacuum Computations

The Stokes vacuum calculator, a slide rule designed for quick calculations in vacuum research and processing work, performs numerous useful computing chores. It will determine the needed pump capacity to evacuate a given volume

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May 10, 1951

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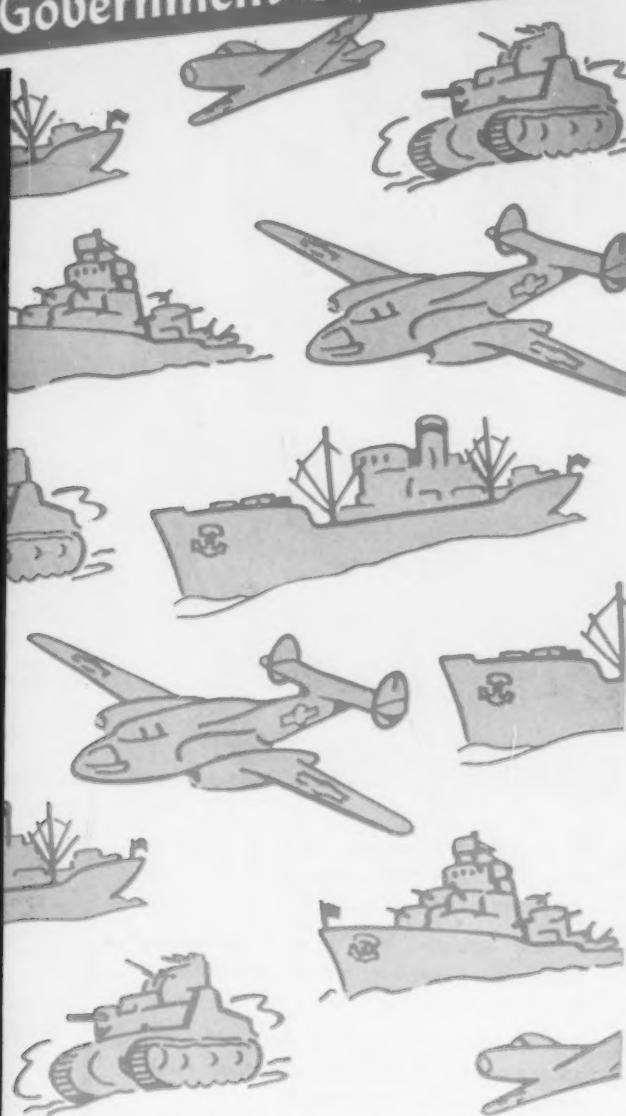
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to a specified vacuum in a given time, and the time required to reach a specified vacuum in a given volume with a pump whose capacity is known. It will also determine vapor pressures of water at various temperatures, and capacities of round tanks in both cu ft per ft and gal per ft. On the reverse side are useful conversion tables. F. J. Stokes Machine Co.

For free copy insert No. 12 on postcard, p. 22

Swiss Gear Hobber

How time savings exceeding 50 pct are effected by automatic radial and longitudinal feed in gear-hobbing is described in a new 6-p. descriptive folder on the Type 75 semi-automatic gear-hobbing machine, developed by S. Lamber S.A., Soleure, Switzerland. Carl Hirschmann Co.

For free copy insert No. 13 on postcard, p. 22

Outlines DO Procedure

While any type of simplified procedure regarding DO orders is well nigh impossible in certain industries, there are some rules and recommendations that cover practically all industry. Among the best set of simplified rules is a new list concisely detailing a general procedure to follow. Hobbs Mfg Co.

For free copy insert No. 14 on postcard, p. 22

Lab Equipment

Scientific instruments, laboratory apparatus, and safety devices developed and introduced during the past 2 years are illustrated and described in a 6-p. folder. The bulletin lists 37 new items which have been made available since the company published its most recent catalog supplement. Fischer Scientific Co.

For free copy insert No. 15 on postcard, p. 22

Insulated Phone Cables

A new catalog on specifications and engineering characteristics of latex insulated telephone cables presents statistics on capacity and power factors, transmission characteristics, aging, tensile strength, resistance and constructions. A special section is devoted to a new cable splice housing developed by



1. Cab-operated monorail hoists serve single bays or entire plants—from yards or unloading areas—without rehandling.
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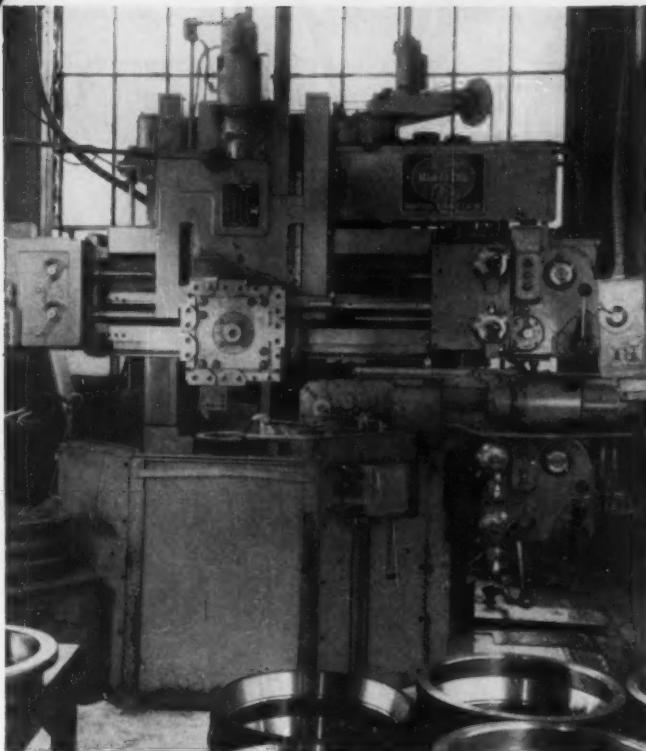
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ONE MAN-AU-TROL V.T.L. REPLACED FOUR FORMER MACHINES — *for the same class of work . . .*

It handles profitably a variety of comparatively short run jobs.

Single cones 10" to 20" in diameter, Double cones, Single cups, Double cups, Closing rings and Large cup and cone spacers are the regular run of work.

Man-Au-Trol's rugged design provides the rigidity required for the most efficient use of carbide tooling. Here at Tyson they say, "We run the machine at 300 feet per minute on Krupp steel as against the former 60 feet per minute. On Man-Au-Trol we feed at 1/32" per rev. and still hold the work and keep it round. We like the great flexibility of this machine."

From the operator we hear — "The Man-Au-Trol is the best machine in the shop. We use it on any work — delicate or big. It cuts anything it can hold — if it's a rugged piece, she sure gets a good bite. It takes no time to get set, less than on most other machines I've worked on. Adjustments are easy and if the machine is set right, she holds sizes and every piece comes out right. There is no fiddling around for a day or two." *This case study proves that replacement of Economically tired machinery is not only basically sound business but also a means towards Improved Earnings.*

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U. S. Rubber engineers which eliminates hand taping. United States Rubber Co.

For free copy insert No. 16 on postcard, p. 37.

Metal Cleaner Booklet

Four Cowles metal cleaners are discussed in a new 8-p. booklet, especially designed to explain how and why operating time can be cut and cleaner costs lowered when the products are used in heavy duty metal cleaning. It points out types of soil removed and the physical and chemical methods used in their removal. HD-N cleaner is discussed fully, along with LP cleaner for removing buffing and drawing compounds, SK cleaner for oil, fat and grease removal and Lixol cleaner for use in pressure-spray washers. Cowles Chemical Co.

For free copy insert No. 17 on postcard, p. 37.

Electronic Temp Control

A new 4-p. bulletin covers both electric and pneumatic systems for control of continuous hardening furnaces of either gas or electric fired type. Complete specifications are included for standard systems, and many options are listed covering special cases. One section of the folder deals with electronic proportioning relays. Minneapolis-Honeywell Regulator Co.

For free copy insert No. 18 on postcard, p. 37.

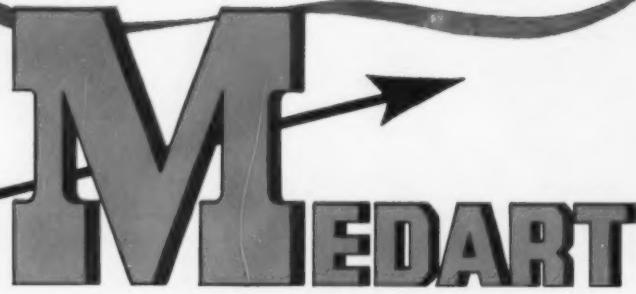
For Air Conditioning

The equipment needed to do a job of air conditioning: Cooling, heating, dehumidifying, cleaning, filtering, circulating; or ventilating; or air handling is shown in a new 16-p. condensed catalog. The booklet covers hermetically-sealed compressors, condensers, water coolers, heating and cooling coils, air-handling units, heating and ventilating units, surface dehumidifiers, air washers, filter washers, self-contained air-conditioning units, unit heaters, industrial heaters, centrifugal fans, axiflo pressure fans, V-belt ventilating sets, direct-connected ventilating sets, a variety of fans and other items. Westinghouse Electric Corp.

For free copy insert No. 19 on postcard, p. 37.

Resume Your Reading on Page 37

Straighten Pipe & Tube
Up To 24" At High Speed



MULTICYCLE STRAIGHTENERS

FOR PIPE & TUBE
 $\frac{1}{16}$ " TO 24" DIAMETER



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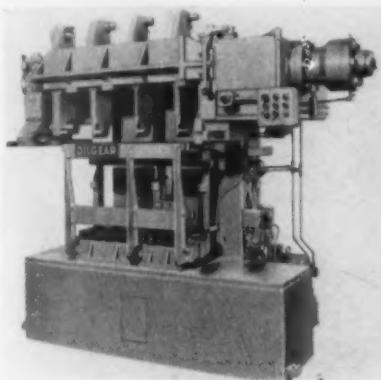
Continued from Page 40

are available in sizes 0, 1, 2, 3, and 4 for a wide variety of uses. Arrow-Hart & Hegeman Electric Co. For more data insert No. 37 on postcard, p. 37.

Bushing Assembling Press

Assembles 3 or 4 sizes cam shaft bushings into diesel engine blocks.

In one operation on this press three or four different sizes cam shaft bushings are assembled into four or six cylinder diesel engine blocks weighing up to 950 lb. The press features semi-automatic, interlocked, electric-hydraulic control with alternative manual push-



button control. Pressing and return speeds are variable. Operator's work is reduced to slipping split bushings on pins, keeper rings on bushings, and guiding block to assembling position. Its hydraulic elevator will not raise block nor operate main ram until bushings are in place and block is in approximate assembling position. Fluid power is supplied by Oilgear two-way variable delivery pump direct connected to a 3 hp, 1200 rpm electric motor. Oilgear Co.

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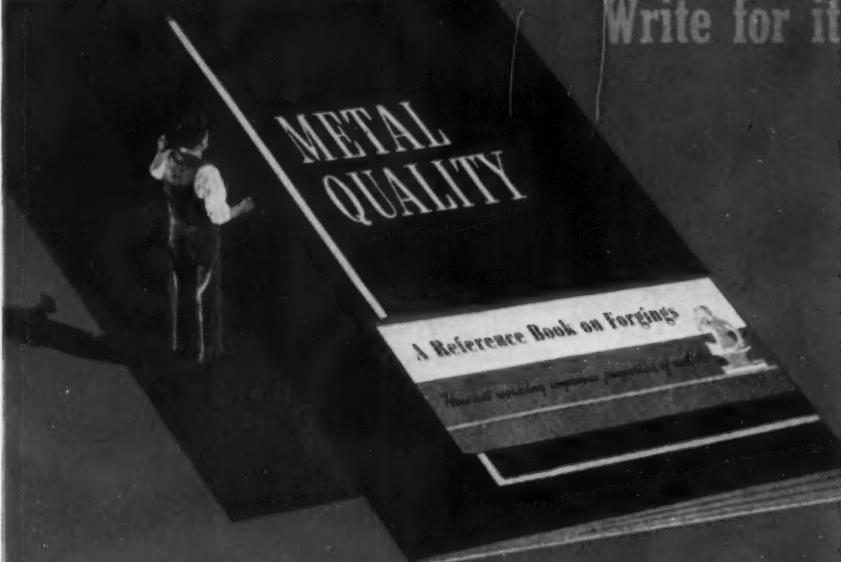
Ceramic Coating

Withstands oxidation, corrosion, flexing, vibration, thermal shocks.

A new ceramic coating for metals and alloys, known as Elkote, provides a protective barrier against corrosion and oxidation at temperatures up to 2400°F. It also withstands prolonged immersion in corrosive liquids. It adheres firmly to metals of widely different co-

To reduce rejects at the point of assembly, use forgings. **Forgings** offer almost a 100 per cent yield of sound parts because forgings are unusually free of concealed defects. This **REFERENCE BOOK** on forgings reveals the full significance of all the engineering, production and economic advantages that forgings offer.

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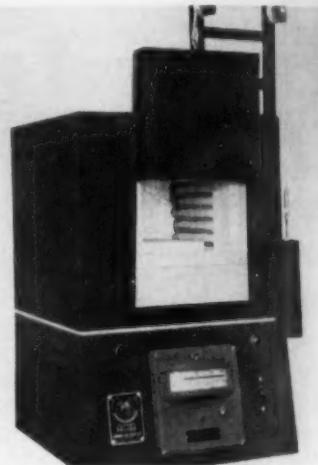
efficients of expansion, even when subjected to flexing, percussion, vibration and sudden extreme temperature changes. The company has offered to coat and return for test, metal samples submitted to it. *Elraco Engineering Co.*

For more data insert No. 39 on postcard, p. 37.

Heat Treating Furnace

Control of temperatures, 300° to 2200°F, for hardening, tempering.

A new combination hardening and tempering furnace with a Huppert Infiltral and electronic controller gives the operator automatic



control of temperatures from 300° to 2200°F. Model No. 869 furnace is 8 in. wide x 6 in. high x 9 in. deep with maximum current consumption of 4 kw. It is wired for 220 v single phase operation. An easy to operate counterweighted door rides in a wedge slide to seal the door in the closed position. Heating elements are made of non-scaling, non-flaking high temperature coiled alloy wire. Multi-insulation construction allows full heat retention. The furnace is built as a floor or bench model. *K. H. Huppert Co.*

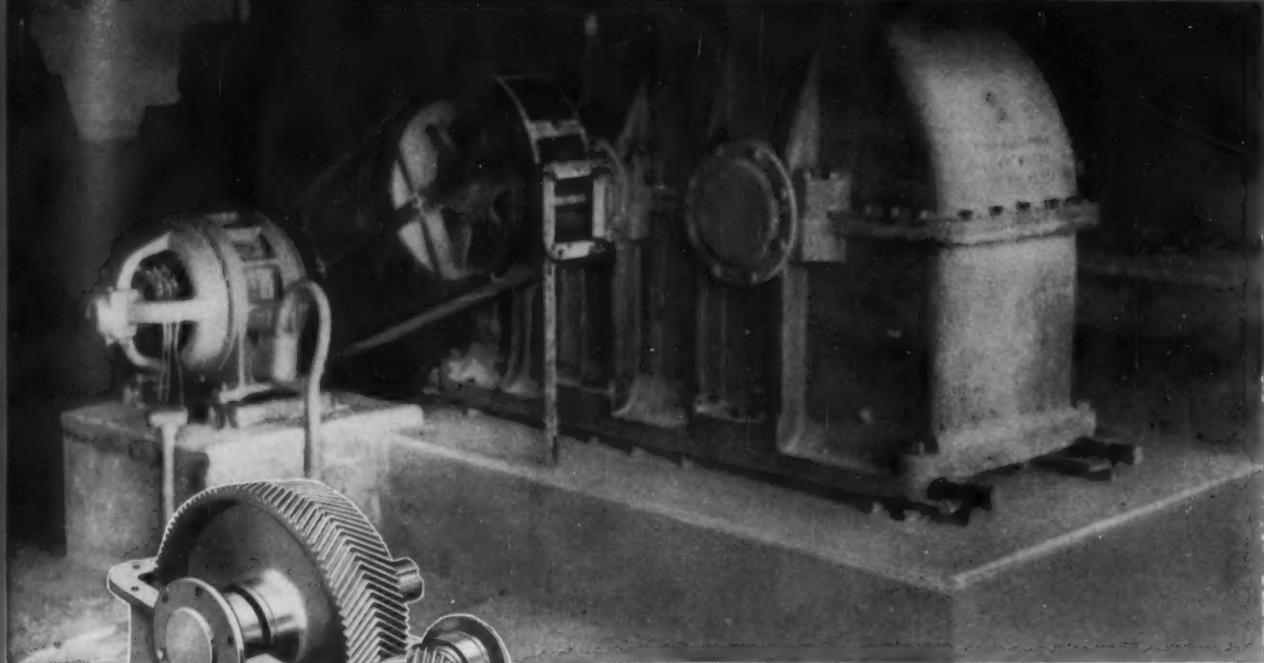
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Pneumatic Screwdriver

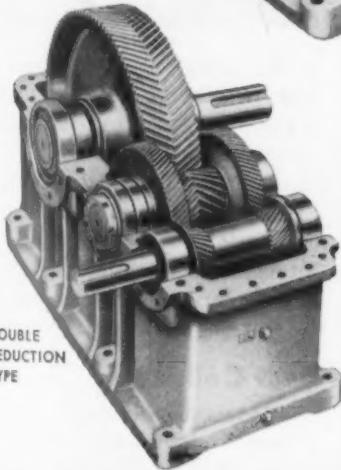
Adjustable clutch with slip-impact action tightens driven screw.

Known as the Cleco nonreversible screwdriver, this new tool can be converted from a screwdriver into a nutrunner in less than $\frac{1}{2}$ min without the use of special tools. Finders and bits can be changed

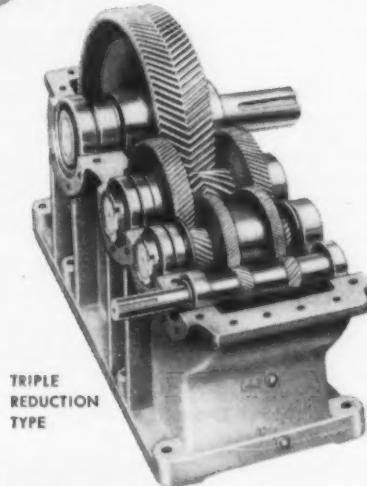
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Because of symmetry of design of these units, the bearings share the load equally. This well planned construction permits the use of 2 standard bearings on each shaft, rather than the usual offset design. The balanced arrangement of the gears further reduces shaft stresses and eliminates end thrusts.

Philadelphia Herringbone Reducers are built in single, double and triple reductions, depending upon the number of gear trains used. Each type covers a wide range of sizes and ratios . . . as standard ratios are from 1.75 to 1 up to 320 to 1, practically any equipment can be provided with the correct operating speeds. These units are also ideal for speed increasing. Efficiencies are obtained up to 98%.

For complete details about Philadelphia Herringbone Units, send for catalog H-49 . . . use your business letterhead, please.



Philadelphia Gear Works, Inc.

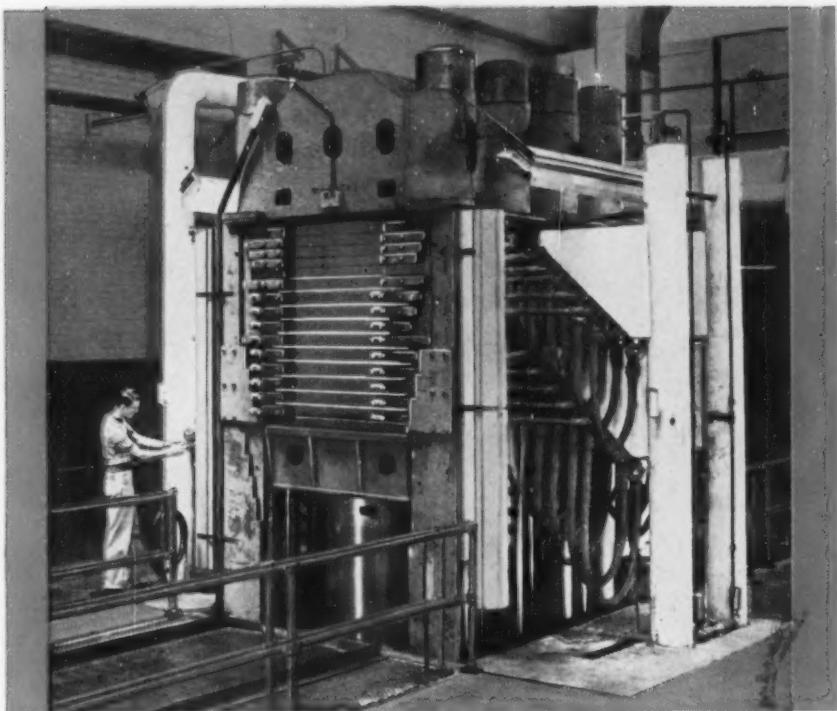


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production ideas

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NATIONAL PLASTIC thermo-sets Plastic Laminates with 3500-ton FARQUHAR HYDRAULIC PRESS

The National Plastic Products Company, of Odenton, Maryland, required a hydraulic press for use in the thermo-setting of their NEVAMAR Plastic Laminates . . . a press that would be able to mold this material to very close tolerances.

Farquhar engineers supplied the answer with this built-to-specifications Hydraulic Press. The complete, self-contained hydraulic pumping unit has a capacity of 3500 tons. Each of the 15 hot plates has a clear working area of 50" x 100". Total working stroke: 49".

The efficient Farquhar hydraulic circuit operates with a minimum number of valves —thus reducing maintenance cost considerably.

Its production problem solved, National Plastic is now successfully turning out Plastic Laminates to their exacting requirements.

GET THE DETAILS on how our Deferred Payment Plan helps you pay for your Farquhar Hydraulic Press out of the savings it produces!

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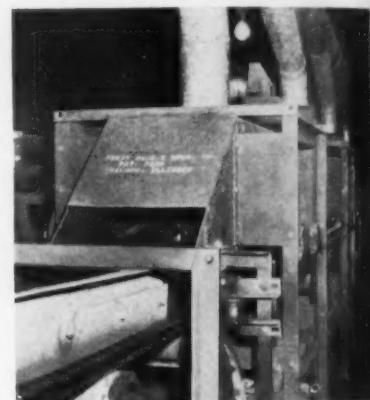
without dismantling any part of the tool. Capacity is for $\frac{1}{4}$ -in. bolts and screws. A grip handle controls operating speeds up to 1000 rpm and three finger adjustable clutch with slip-impact action assures uniform final tightening of the driven screw. Cleco Div., Reed Roller Co.

For more data insert No. 41 on postcard, p. 22.

Sand Conditioner

Improves quality, boosts output, cuts original installation costs.

The Pekay Mixer - Muller is claimed to have increased output 85 pct in one foundry, after six months' operation. Sand is more flowable, lump-free and appreciably cooler. Permeability is increased,



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Just one more example of cost-cutting Farquhar performance in heavy production. Farquhar Presses are built for the job . . . assure faster production due to rapid advance and return of the ram . . . greater accuracy because of the extra guides on moving platen . . . easy, smooth operation with finger-tip controls . . . longer life due to positive control of speed and pressure on the die . . . long, dependable service with minimum maintenance cost!

Farquhar engineers are ready to help solve whatever production problem you may have. Give them a call.

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green compression strength is up and the correct moisture content is reportedly maintained. Bonding material use is cut by half. The unit can be installed at any point in any existing belt system, without major rebuilding, and without interference with ventilation. Pekay Machine & Engineering Co.

For more data insert No. 42 on postcard, p. 22.

Dust Collector

Filterless, bantam size, exhausts cleaned air to out-of-doors.

The Model 4N20 Dustkop dust collector develops a rated 437 cfm and 5000 fpm velocity at the inlet. This amount of suction is said to be adequate to handle a buffing, polishing or grinding wheel up to 10-in. diam, or two wheels for similar work from 3 to 7-in. diam. The unit is self-contained, motive power being a 1/3 hp, 3600 rpm

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Specific Gravity
Thermal Expansion
Thermal Conductivity
Electrical Properties
Thermal Stability

MECHANICAL PROPERTIES

Tensile Properties
Compressive Properties
Shear
Bearing
Modulus of Elasticity
Modulus of Rigidity
Poisson's Ratio

CHEMICAL PROPERTIES

PRODUCTS MANUFACTURED

Primary Magnesium
Alloy Ingots

CASTINGS

SAND CASTINGS

Grades
Alloys
Tolerances
Patterns
Inserts
Heat Treatment
Finish

PERMANENT MOLD CASTINGS

Alloys
Design
Dies
Heat Treatment

CASTINGS—Cont'd

DIE CASTINGS

Alloys
Design
Dies
Sizes and Tolerances
Finish

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Grades
Alloys
Dies
Finish
Definitions
Lengths

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Tolerances

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Alloys
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Tolerances

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Here is a handy compilation of the latest information on Magnesium Alloys and Products. The purpose of this book is to acquaint the reader with the forms in which magnesium is manufactured and to provide information on properties, sizes, tolerances and other significant data.

If you are using magnesium now, or contemplate using it in the future, you will find this handbook of vital importance. For your copy of "Magnesium Alloys and Products" simply write to Dept. MG-25, using your company letterhead.

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production ideas

Continued

continuous duty motor direct driving a self-clearing paddle-wheel type fan. Dust laden and obnoxious odors, toxic fumes, etc., are sent into the cyclone separator, where all material is removed from



On the job in
Western New York!

TORRINGTON'S NEW, HIGH SPEED FLAT WIRE MILL

- ★ Individual motor drive for each flattener stand!
- ★ Automatic adjustable constant tension on pay-off and winder!
- ★ All rolls in pre-loaded precision type bearings!
- ★ Driven edging rolls after each stand except finishing stand!
- ★ Magnetic gauges for continuous gauging of wire thickness and width!
- ★ External coolant system for work and rolls!
- ★ Internal cooling on flattening rolls!
- ★ All gearing totally enclosed and running in oil!

This tandem flat wire rolling and edging equipment produces flat, square or rectangular shaped wire from round rod or wire. In Torrington flat wire mills, the metal passes successively from the pay-off through breakdown rolls, grooved edging rolls and final finishing rolls onto a winder. Magnetic gauges measure the wire between finishing rolls and winder.

Precision production to thickness tolerances as exacting as .00025" and to .001" on the width is possible with Torrington Flat Wire Rolling and Edging Equipment. This unusually high degree of accuracy is the result of 60 years experience in the design and construction of auxiliary mill equipment.

Call or write Torrington today for more information
and name of nearest Torrington representative.

The **TORRINGTON**
MANUFACTURING COMPANY TORRINGTON, CONNECTICUT

DESIGNERS AND BUILDERS OF MILL MACHINERY FOR OVER 60 YEARS



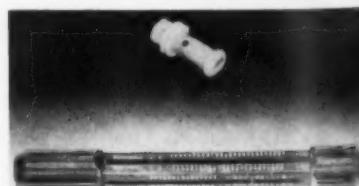
the air stream except the toxic odors, fumes and the extremely fine dusts which are exhausted to the out-of-doors through the outlet at the top of the cyclone. Sheet metal pipe completes the installation. *Aget-Detroit Co.*

For more data insert No. 43 on postcard, p. 2.

Hardness Tester

Bearing retainers of nylon contribute to accuracy, durability.

The Metalometer hardness tester contains a hardened steel rod that is locked in position when raised by the knob at the top of the tester. Release of the trigger above the



hammer releases the plunger, which rebounds from the surface of the metal being tested. At the highest point of rebound, the plunger is locked in position and permits hardness readings on the instrument's Rockwell C, Rockwell B and Brinell scales. Use of three steel balls in a retainer machined from nylon rod made by Polymer Corp. solved the problem of locking the plunger following its rebound. Nylon was used

Rheemcote Process Gas-fired oven at New Orleans plant pre-heats, bakes and cools sheet finishes at 4,200 per hr. rate.

Rheem Manufacturing Company's giant metal offset press lithographs 3'x6' sheets of 18-gauge steel at a 4,200 per hr. rate.



color lithography on metal depends on *GAS* for processing

at Rheem Manufacturing Company

Rheem Manufacturing Company's engineers worked with engineers of Wagner Litho Machinery Division to develop the GAS oven and related equipment necessary to lithograph and fabricate 55-gallon steel drums.

18-gauge steel sheets, 3'x6' are fed into the giant offset press at a maximum speed of 4,200 per hr. After printing and coating, the sheets travel through a Gas-fired 210° oven to be dried:

Pre-heat zone: 200°-275° F. for 6 min.
Baking zone: 175°-450° F. for 15 min.
Controlled cooling zone for 7 min.

After lithographing one side and lining the other, sheets are fabricated into steel drums. This Rheemcote Process permits users to identify their products in drums with familiar, colorful trade-marks. Liquid and solid materials and chemicals are shipped all over the world in these Brand-name drums.

The Rheemcote Process is an example of how GAS can be used to meet specialized problems in a production line. Gas is the ideal fuel to use, because Gas temperatures are readily controlled automatically, because Gas is clean, efficient, and economical. Whatever your requirements, learn how GAS can serve you. Call your Gas Company Representative today for the facts.

AMERICAN GAS ASSOCIATION
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**ELIMINATE
STEEL HANDLING
BOTTLE NECKS**



ROSS Series 100 CARRIER
...simplest mass handling method known!

Now...you can move 45,000-pound payloads of billets, bars, plate, in-process and finished steel *where you want them when you want them*...at a moment's notice!

Now...you can be free of the restrictions of a plant railroad handling system...its expensive trackage, cars, locomotives...costly, time-consuming switching operations!

Now...you can prevent congestion in the mill...free more mill space for production operations...eliminate costly re-handling...save time and money in getting out current orders!

How? With Ross Series 100...the *only* Carriers designed and built all the way through for rough, tough steel mill service...the *only* Carriers with that great reserve strength steel men demand. Self-loading and unloading, Ross Series 100 requires only a driver...and moves capacity loads at speeds up to 33 mph.

Don't overlook the outstanding advantages of the Ross Carrier Steel Handling Method...ASK STEEL MEN WHO KNOW! Get full details on Ross Series 100 Carrier...a 'phone call, wire or letter will do it.

Rely On
ROSS

THE ROSS CARRIER COMPANY

Direct Factory Branches and Distributors Throughout the World
425 Miller St., Benton Harbor, Michigan, U.S.A.

production ideas

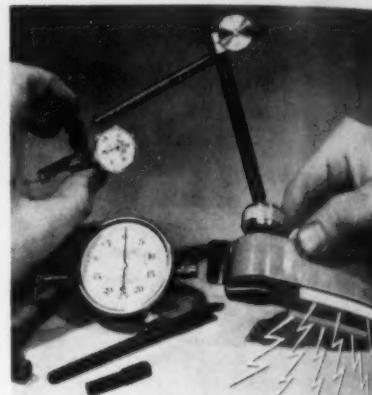
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because of its anti-friction characteristics. It requires no lubrication and is not affected by shop cleaning fluids. *Peabody Industries, Inc.* For more data insert No. 44 on postcard, p. 27.

Magnetic Indicator Holder

Magnetic base attaches with 100-lb pull to flat or curved surfaces.

Holding securely all dial indicators precisely in place, a magnetic base holder is equipped with



a fingertip release for removal or positioning the holder without jarring the instrument being held. The set includes accessories for accommodating all stem type, hole type and lug back indicators. Steel parallel ribs $2\frac{1}{4} \times 1\frac{1}{4} \times 1\frac{1}{4}$ in. provide the magnetic contact surface on the bottom of the unit. Indicators to 3 in. diam may be used with precision and ease. *Enco Mfg. Co.* For more data insert No. 45 on postcard, p. 27.

Tonnage Indicator

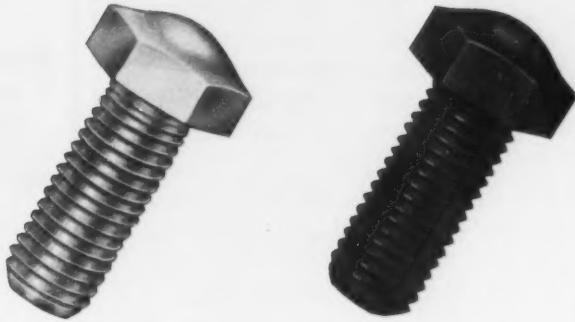
Shows "squeeze" in tons on forging presses.

The device which is a dial indicator, and will become standard equipment on new Maxipreses, permits forging to closer tolerances



Announcing the New Look by **FERRY CAP**

CROWNED HEADS



SHINYCROWNS *The King of Hex Heads*

For General Use

SHINYCROWNS are designed to give that "New Look" to assembly where eye appeal, appearance, ultra-quality, and sales interest are paramount. For that "finishing touch" to your assembly, specify **SHINYCROWNS** to secure beauty with service, the last word in ornamental Hex Head design.

SHINYCROWNS are furnished in material C-1018 steel, in sizes 1/4" diameter through 1/2" diameter inclusive, in both coarse and fine threads, in these attractive finishes—plain, zinc, cadmium, nickel or chrome plate. Price governed by quantity desired—Bulk shipments only.

SPECIAL NOTE: Also furnished with polished crown to secure highest possible luster, mirror finish.

SHINYCROWNS-HexHard with hard Hex. Heads are recommended to eliminate poor wrench fit resulting in rounded corners from constant adjustment.

Complete Information and Samples furnished on request.

The FERRY CAP & SET SCREW Co.

2157 SCRANTON ROAD

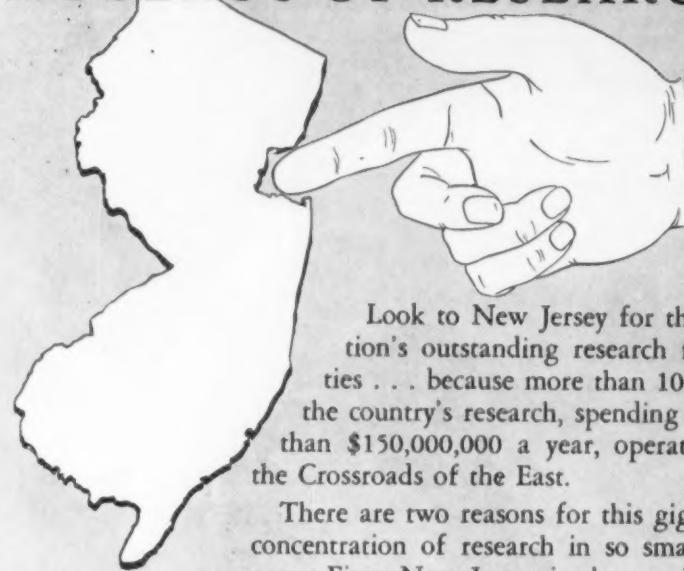
CLEVELAND 13, OHIO

CAP AND SET SCREWS • CONNECTING ROD BOLTS • MAIN BEARING BOLTS • SPRING BOLTS AND SHACKLE BOLTS • HARDENED AND GROUND BOLTS • SPECIAL ALLOY STEEL SCREWS • VALVE TAPPET ADJUSTING SCREWS • AIRCRAFT ENGINE STUDS • ALLOY STEEL AND COMMERCIAL STUDS • FERRY PATENTED ACORN NUTS

production ideas

Continued

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Look to New Jersey for the nation's outstanding research facilities . . . because more than 10% of the country's research, spending more than \$150,000,000 a year, operates at the Crossroads of the East.

There are two reasons for this gigantic concentration of research in so small an area. First, New Jersey is close to home offices in New York and Philadelphia; and second, it is near a wide variety of industrial plants which can put new findings into operation under the close scrutiny of the men who developed them.

Furthermore, the scientists have developed their research laboratories adjoining other research facilities, thereby obtaining the advantage of a continual interplay of ideas and help among themselves and other scientific workers.

Public Service Electric and Gas Company serves the major portion of New Jersey's manufacturing companies and stands ready to supply all types of industry with electricity, gas and transportation.

MORE INFORMATION



about New Jersey is yours for the asking in the 20-page digest, "The Crossroads of the East". Write Box F, 70 Park Pl., Newark, N. J.



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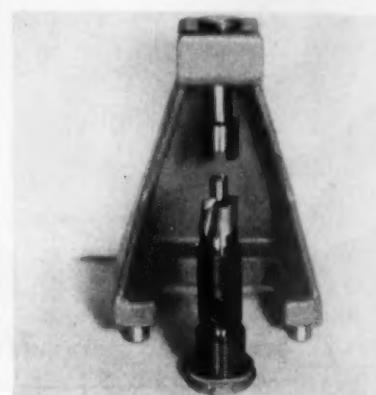
without danger of overload, simpler selection of the proper size Maxi-pres for a given job; and faster die setup. Any variation in press loads gives quicker warning of low heats, improper die setup, or incorrect die impressions. *National Machinery Co.*

For more data insert No. 46 on postcard, p. 27.

Pre-Setting Gages

Save 80 pct setup time on multiple spindle and transfer-type machines.

Two new lines of gages, the Flush Pin Gage and Height Gage, are



used for pre-setting drills, taps, reamers, counterbores, countersinks and other cutting tools that have been inserted in adjustable adapters before being placed in machine spindles. The flush pin gage is cast iron with three hardened jig feet, hardened bushing and pin. Seven sizes gage distances to 14½ in. The height gage is equipped with quick-lock nut for adjusting and locking the gage on the job. Five sizes gage distances to 17 in. *Scully-Jones & Co.*

For more data insert No. 47 on postcard, p. 27.

Diamond Wheel Dresser

Diamond rotates, presenting sharp point to grinding wheel at 7 stations.

By a simple but positive method of rotating the diamond through a sequence of seven stations, mechanically positioned to present a sharp point to the grinding wheel at each station, a diamond pointed abrasive wheel dresser is said to lengthen the life-span of the dia-

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mond more than one-third; reduce diamond resettings to as little as one-tenth; improve finishes; and increase productivity. The tool is designed to give a wide range of approach angles to the grinding wheel and for this reason the diamond is offset in relation to the center line of the shank. Whatever



the angle of approach of existing tool post or dressing fixture may be, the Index-A-Point can be applied so that its head is in a vertical or horizontal position. Anton Smit & Co., Inc.

For more data insert No. 48 on postcard, p. 37.

Tractor-Shovel Unit

Front wheel drive; four forward and four faster reverse speeds.

A $\frac{1}{2}$ -cu yd capacity Payloader features a full-reversing transmission giving four forward and four corresponding but faster reverse speeds. Speedy and easy forward-to-reverse motion is provided by a separate directional shift independent of the regular gear shift. Rear wheel steer and compact, short wheelbase design assure ut-

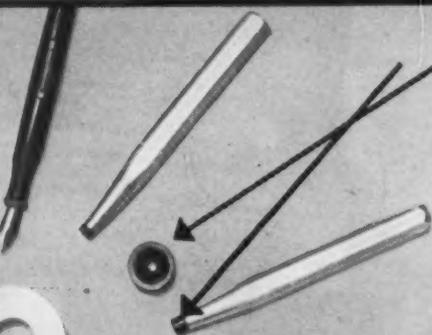


most maneuverability and short turning radius. The heavy duty engine is mounted at the rear to provide maximum capacity and stability. Lifting and lowering, and the dumping and closing of the bucket are accomplished by hydraulic rams by fingertip effort of the operator. Frank G. Hough Co. For more data insert No. 49 on postcard, p. 37. *Resume Your Reading on Page 41*



SMOOTH

ARALDITE RESINS used as smoothing compounds on bus bodies, train coaches, jet-type planes, etc. Hardens quickly . . . can be sanded . . . high alkali and acid resistance. Non-shrinking, deep indentations can be filled in one application.



TIGHT

ARALDITE RESINS durably bond boron carbide tips to stems of aluminum pestles. Also bonds other heat-resistant materials, joins aluminum and zinc die-castings, pole pieces on magnets, etc.

 **Araldite***
WITH ETHOXYLINE RESINS

Fabricators seeking new, improved, simplified, time-and money saving bonding, casting and coating mediums, will find in these new but already extensively applied resins, an exceptional opportunity to put their ideas to work. Details of the properties and typical applications for Araldite Resins are fully described in newly published technical manuals, free upon request written on Company letterhead.

*Trade Mark of Ciba Company Inc.

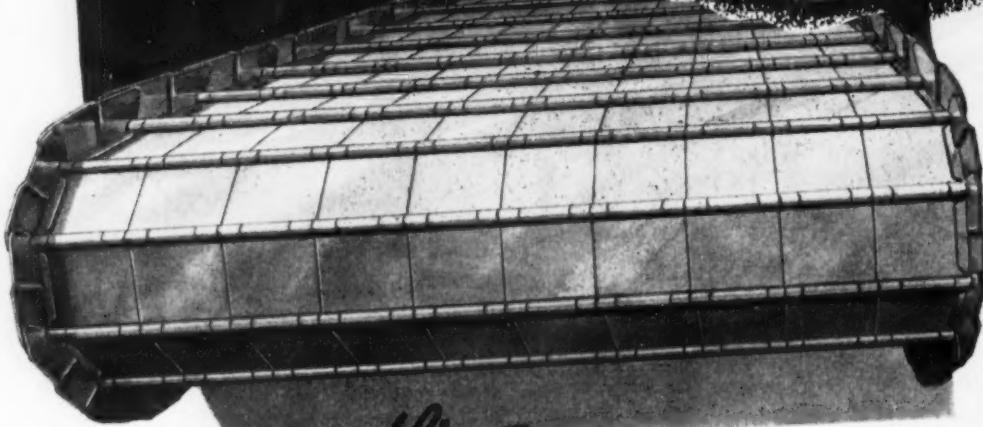


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PRODUCTION MEMO

HINGED STEEL CONVEYOR BELTING

This can solve our problem!



For handling

STEEL SCRAP • STAMPINGS • METAL PARTS
FLASH • HOT FORGINGS • TURNINGS & CHIPS

Assembled to your specifications from stocked component parts, MAY-FRAN Hinged Steel Conveyor Belting will withstand the maximum production punishment your plant can give. Only MAY-FRAN hinged steel belting will handle hot or highly abrasive metal parts, scrap, forgings, stampings, flash and turnings as well as wet or dry chips.

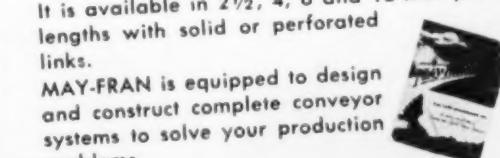
The precision-formed heavy-gauge hinged steel links are assembled by means of high-carbon steel rods, and the side chains become an integral part of the belt. Outside links incorporate the newly designed in-



terlocking wings which remain positively engaged at all times, even when belting is traveling over sprockets. Link and rod construction eliminates fall-through.

MAY-FRAN hinged-steel conveyor belting can be furnished in practically any width or length to meet your requirements. It is available in 2½, 4, 6 and 12-inch pitch lengths with solid or perforated links.

MAY-FRAN is equipped to design and construct complete conveyor systems to solve your production problems.



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IRON AGE markets and prices

market
briefs
and
bulletins

magnesium—New users of magnesium for civilian die casting face a rough time ahead. Until recently this light metal was a drug on the market, with December, 1950, production one tenth the high figure of 20,056 short tons in Jan., 1944. Now, the Dow Chemical Co. sets aside about 1.5 million lb a month for civilian uses after taking out military and DO's. Regular customers are taking a 25 to 40 pct cut on their mag quotas.

foil production—Shipments of aluminum foil during March totaled 9,811,894 lb. Total for the first quarter was 27,702,255 lb, at a rate well above last year's shipments of 90,679,719 lb. This relatively "new" product has an even bigger future.

conversion—The conversion market is still strong, but it has been learned that several big appliance makers have cancelled conversion arrangements with one mill. The mill was also told that they had cancelled deals with their ingot sources. On the other hand there are plenty of people around to take up the slack.

stainless—Stainless is in a class with alloy steels—in short supply and not covered by M-6. In the Midwest some warehouses report DO's are accounting for 75 pct of stainless shipments. Along the Eastern Seaboard all stainless is on DO's. Textile and chemical industries are suffering most from the tight stainless supply.

foreign concrete bars—Concrete reinforcing bars from England are available in the East. Several Delaware contractors have been offered "all they can use." Price is the stickler—\$150 per ton.

refuse jobs—Because of the shortage of structural steel, some fabricators in and around Philadelphia have refused to bid on new jobs. Small-size channels rank with bars at the head of the shortage list.

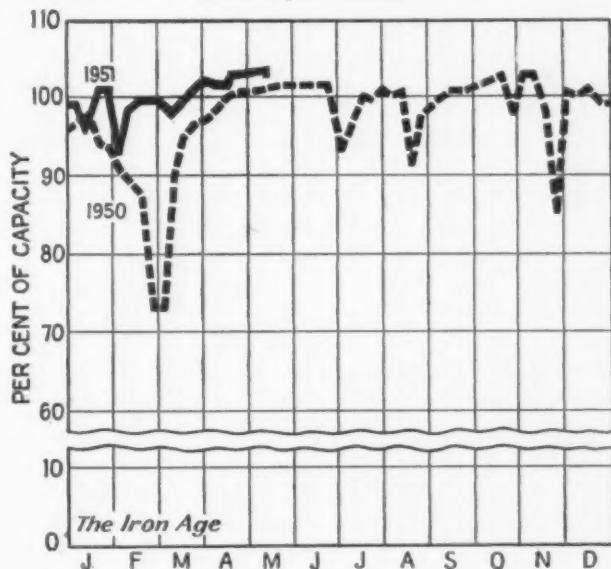
alloy bar—The alloy bar shortage is getting no better. One large Midwest user is now getting about a third of normal alloy allotments. Meanwhile, the boron picture is encouraging. Trial uses of boron steel for a wide variety of applications are reported satisfactory. These include bolts, springs and transmission gears.

lithium—Fifteen years of planning by Foote Mineral Co. is bearing fruit. Foote's new expansion program will enlarge existing facilities at their Exton, Pa., plant and fill a growing demand for all types of lithium. Foote controls one of the largest sources of lithium in this hemisphere at Kings Mountain, N. C.

steel shipments—March shipments of steel mill products totaled 7,105,078 tons, a new record high, according to the American Iron and Steel Institute. The March figure was 200,000 tons above the previous high, set in January, and 1,382,000 above the March 1950 total. Alloy steel shipments were 37 pct higher and stainless shipments were up 40 pct.

Chile copper up 3¢—The State Dept. has announced that 3¢ per lb more would be paid for Chilean copper. This brings the price to 27.5¢ but nobody knows who is going to pay the extra 3¢. It will probably be passed on to the consumer but that will mean either a revision of the price freeze or a specific price order for copper.

Steel Operations †



District Operating Rates—Per Cent of Capacity †

Week of	Pittsburgh	Chicago	Youngstown	Philadelphia	West	Buffalo	Cleveland	Detroit	Wheeling	South	Ohio River	St. Louis	East	Aggregate
Apr. 29	103.0*	106.0*	98.0	100.0	102.0	104.0	100.0	104.0*	101.0	100.0	97.0	92.5	119.0	104.0
May 6	103.0	107.5	96.0	100.5	104.0	104.0	102.0	106.0	101.0	103.0	97.0	86.5	112.5	104.0

* Revised.

† Beginning Jan. 1, 1951, operations are based on annual capacity of 104,229,850 net tons.

nonferrous metals

outlook and
market activities

NONFERROUS METALS PRICES

	May 2	May 3	May 4	May 5	May 7	May 8
Copper, electro, Conn....	24.50	24.50	24.50	24.50	24.50	24.50
Copper, Lake delivered..	24.625	24.625	24.625	24.625	24.625	24.625
Tin, Straits, New York....	\$1.42	\$1.42	\$1.42	....	\$1.42	\$1.42*
Zinc, East St. Louis	17.50	17.50	17.50	17.50	17.50	17.50
Lead, St. Louis	16.80	16.80	16.80	16.80	16.80	16.80

Note: Quotations are going prices.

*Tentative.



by R. Hatschek

Nickel Scrap Order—After much delay, the Office of Price Stabilization has finally issued its first order rolling back nonferrous scrap prices. The order, CPR 29, covers nickel, Monel, cupro-nickel alloys and stainless steel and is an attempt to shove back scrap prices into a normal relationship with primary nickel.

Effective May 8 the ceiling on pure nickel is $40\frac{1}{2}\text{¢}$ per lb f.o.b. shipping point with differentials for other grades. A $2\frac{1}{2}\text{¢}$ to 4¢ premium is allowed for converting the scrap so that it is suitable for direct industrial use and a quantity premium of $\frac{1}{2}\text{¢}$ per lb is permitted on nickel shipments exceeding 2000 lb and on Monel shipments of over 20,000 lb.

Some Contracts Okay—A 30-day period of grace is given during which dealers may deliver material at prices over the ceiling. Two "ifs" modify this provision: (1) If the material was contracted for prior to May 3 and (2) if the material had been received or was in transit at above-ceiling prices to the person making delivery before May 3.

Trade Reacts—Feelings in the metals scrap trade are mixed. Some individuals say that it is about time something was done—

and ask when other metal prices will fall before OPS controls. Others say that the rollback was far too drastic and that an increase should be permitted in the price of new nickel.

Still the biggest question facing the industry is if, when and how far other metals will be rolled back. Under the present order, the copper content of cupro-nickel alloy scrap is pegged at 15¢ per lb. Is this an indication of the future?

Aluminum Output Rises—Production figures for the aluminum industry continued to soar during the month of March. The nation's output of primary aluminum for that month totaled 140,044,429 lb, bringing the total production for the first quarter to 401,431,462 lb.

The quarter's output was about 5 pct more than the last quarter of 1950 and 25 pct more than the first quarter of last year. If duplicated in later quarters this year, this production indicates a yearly output of better than 1.6 billion lb. But the rub is that there still isn't enough aluminum to even come close to satisfying the terrific demand for the metal.

Ease Aluminum Bite—National Production Authority has once again taken partial pity on civilian aluminum consumers. This

time it is the makers of aluminum windows, window screen frames and openers for loose leaf ledgers. These manufacturers will now be permitted by NPA to use 65 pct of their average monthly consumption for the first half of 1950 during the months of May and June. They had previously been cut to 50 pct.

CMP Will be Rough—A high NPA official has stated that the Controlled Materials Plan cannot work smoothly at least until well into the third quarter. The complexities of the plan make it impossible.

The official went further to say that production of consumer durable goods at 65 to 70 pct of capacity will be possible in the third quarter but that the uneven nature of today's shortages could not assure this in all industries. He went further to say that the military programs were coming along well and that only a few minor shortages had slowed military output.

Correction—The April average price for Lake copper was incorrectly quoted at 25.625¢ per lb last week; correct price was 24.625¢ . Also, the price for electrolytic copper was unchanged at 24.50¢ per lb throughout the month.